THE TASMANIAN NATURALIST

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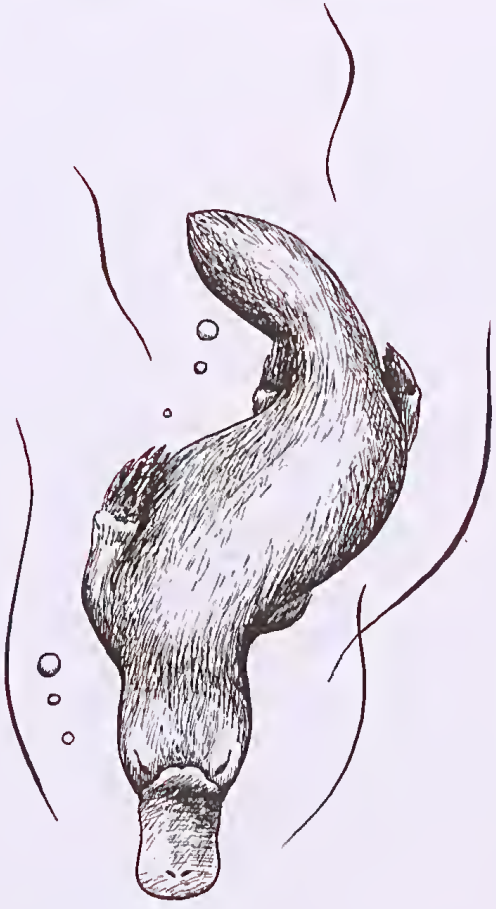

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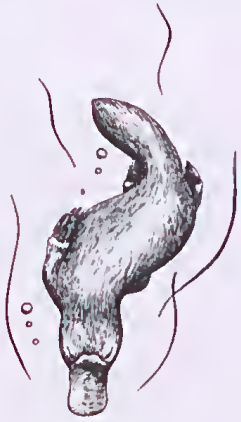

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THE TASMANIAN NATURALIST

EDITOR: MARK WAPSTRA

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EDITORIAL NOTE

Mark Wapstra

Editor, *The Tasmanian Naturalist*

During 2012 I completed the scanning of the remaining articles from *The Tasmanian Naturalist*, which have now been made available for free downloading on the Club's website (what am I going to do with my free time now?!). I worked out that I scanned approximately 2,200 pages over the last 3 years – looking at the dates on the files, it seems I started in April 2010 and finished in June 2012. Thanks go to Geoff Fenton for starting the uploading of pdf files in 2011/2012, and to Simon Grove for redesigning the download section of the website and uploading the remainder of the files during the year. These files are available for download to members and non-members for free. I hope that this becomes a well-used resource, not just in Tasmania, but around the world. Please visit the site and sample what is on offer – there is an Excel file you can download to access the full index of volumes, titles, and authors. There are some fascinating articles on pretty much every natural history subject. Be inspired and contribute something next year!

This is my 6th year as your Editor. In my mind (but not necessarily other people's), I was going to have a maximum 5-year term, but I seem to get merrily re-enlisted each year. If anyone wants to have a turn, stick up your hand. Or if you want to ease into it, I'm happy to co-edit or work with a small team. Don't get me wrong, I love the job but I want to make sure other members are not excluded.

As always, somehow *I've* managed to put together a volume stacked full of (bio)diversity. But really, I just *edit* and *layout*. The *real contributions* are from the authors – thanks for the great range of long and short articles on topics as diverse as rain, orchids, weeds, frogs, snakes, crayfish, millipedes, cockroaches, whales and petrels! I hope readers are pleased and do what I do – sit the *Naturalist* on the coffee table and pick it up again and again to read over the holiday period. Personally, I very much appreciate the content and tone of several of the submissions, which show that one-off serendipitous observations can add greatly to our collective knowledge, and that being a scientist and/or naturalist isn't always about the observation itself: it can also be about being in the moment of the observation, seeing the colours of the landscape or the patterns in nature.

The Club gratefully acknowledges the sponsorship by *The Maria Island Walk* (www.mariaislandwalk.com.au), *The Bookend Trust* (www.bookendtrust.com) and *Environmental Consulting Options Tasmania* (www.ecotas.com.au) for contributing to the cost of producing the 2012 volume, which is stacked full of high quality colour digital images. Their generous support allows us to keep membership fees low and still produce a quality bound and printed journal.

A PICTURE'S WORTH SIXTY WORDS

Simon Grove

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The informal code of conduct for many of today's naturalists might include the exhortation to 'take nothing but photos and leave nothing but footprints', reflecting a widespread modern preference for capturing the essence of nature digitally rather than as collected specimens. Unlike bulky and cumbersome collecting gear, high-quality compact cameras can be carried with us wherever we wander, allowing us so many more opportunities to capture those moments of serendipity that are a hallmark of our relationship with the natural world.

We are very visually-oriented creatures, attuned to reading much into photographic compositions. As the saying goes, a picture's worth a thousand words. Even so, pictures on their own cannot tell us – or those we share our pictures with – the whole story. Add a few words, even just a caption, and the naturalist's story behind the picture begins to emerge – as, too, do glimpses of the naturalist's own quirks and foibles.

In the following pages I have coupled photos and text to explore an eclectic cross-section of Tasmanian natural-history subjects. Each photo was taken in Tasmania and depended on nothing more complicated than a compact camera and a typical dose of natural serendipity. Each couplet was an entry into a photo competition staged by the Ecological Society of Australia last year. The greater challenge for me was not in composing the image, but in capturing the story, the ecological essence of each photo, in a title and caption of no more than sixty words, as per the rules of the competition.

I hope you enjoy the words and images as much as I enjoyed composing them.

Blow-in from the blue fleet

The 'blue fleet' is one name for the diverse community of bladdered, bubble-bound or otherwise buoyant pelagic organisms that drift on the open ocean at the mercy of the currents. Beachgoers beware! – the most regularly beached member of the blue fleet in Tasmania is the bluebottle *Physalia utriculus*, a colonial siphonophore whose main fishing tentacle can deliver a powerful sting.

[February 2010, Schouten Island]

Star of the South

Though it looks tropical, the eyed sea-star *Nectria ocellata* is only found around the coast of southern Australia, where it preys on sponges and sea-squirts growing on rocks in shallow water. This one was washed up live at Cockle Creek, near the southern tip of Tasmania.

[April 2009, Cockle Creek]

Tea at the beach

The rocks underlying Tasmania's Rocky Cape are pre-Cambrian quartzites, which give rise to beautiful white, sandy beaches but yield nutrient-poor, podsolised soils supporting peaty button-grass and tea-tree communities. The tannins leaking from this vegetation after heavy rain are similar to those that give tea its characteristic hues; here they have stained the floodwaters of a creek emerging onto the beach.

[September 2010, Rocky Cape]

Living on the edge

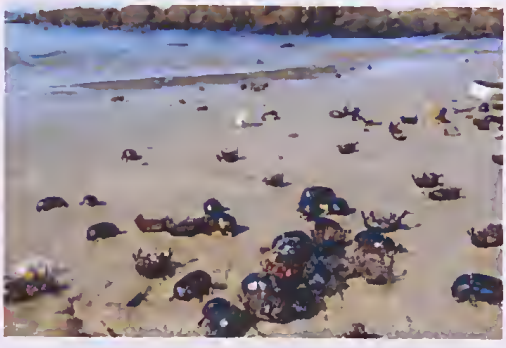
Seething beds of bull kelp *Durvillaea potatorum* and strapweed *Lessonia corrugata* are common along exposed parts of southern Tasmania's rugged and indented coastline, such as here on Bruny Island. But kelp-beds like this are confined to cold waters, and because they occupy a tiny ribbon of intertidal substrate only a few metres wide, they are among the most area-restricted habitats in the country.

[December 2008, The Neck, Bruny Island]

Not the aftermath of a tomato-sauce tanker disaster

At Cloudy Bay in southern Tasmania, the normally epiphytic red alga *Asparagopsis armata* has gone pelagic, forming slicks the colour and consistency of tomato sauce. For many years the bay has sported a continuous bloom of the so-called *Falkenbergia* (tetrasporophyte) phase – an apparently natural phenomenon that may owe its persistence to the fertiliser effect of a nearby muttonbird colony.

[April 2007, Cloudy Bay, Bruny Island]



Red-headed pasture-scarabs: the final push south ends in disaster

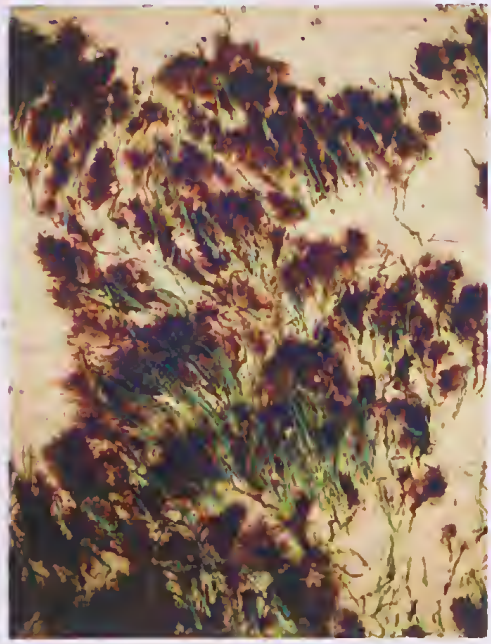
The scarab beetle *Adoryphorus couloni* has long been considered a pasture-pest in southeastern Australia, but was rarer in Tasmania. Recent warm years have seen them push ever southwards. This photo of beetles stranded on a southern Tasmanian beach demonstrates that they've penetrated as far south as they can – unless they find their way across the Southern Ocean to Macquarie Island.

[September 2007, Lauderdale]

Beach delta

As the tide receded on this Tasmanian beach, the seagrass detritus that it left behind morphed into these beautiful dendritic patterns. The abundance of detritivorous sandhoppers skipping among the 'branches' of these trees was a reminder of how the dominant ecological role of seagrasses around the Australian coastline doesn't end when the plants die.

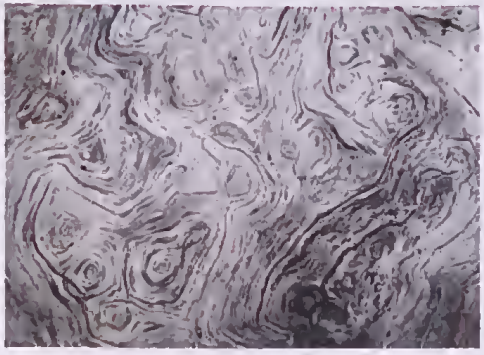
[January 2010, Cape Portland]



Nature mimics art: seaweed and seagrass trees on a beach canvas

No, not Japanese artwork, but seagrass sporting tufts of epiphyllous red algae on a Tasmanian beach. Australia is a hotspot for seagrasses, which help keep our coastal waters productive. This one is *Heterozostera tasmanica*. Its leaves elongate from a basal meristem, helping to counter the shading caused by the algae and leading to their tree-like appearance.

[March 2009, Abels Bay, Cygnet]



Burl

Slow-growing eucalypts lay down dense wood and lace it with extractives that inhibit decay. Burls – the result of the tree's response to injury or infection – are particularly resistant. This burl on a Tasmanian *Eucalyptus obliqua* has lost its bark in a bushfire, revealing characteristic swirling growth-lines encircling long-vanished epicormic shoots, which are interrupted only by the emergence-holes of wood-boring beetles.

[March 2008, Maria Island]

Blind mullets?

Nobody likes to encounter poo in their bathing water – but just look at what nature left behind on this Tasmanian beach! We can't blame sewage outfalls for these little blobs of exerement though – they're produced by countless fragile air-breathers *Salinator fragilis*, snails that feed on the algae and organic detritus that settles on the sand-flats when the tide is in.

[January 2011, Koonya]

Happy feat

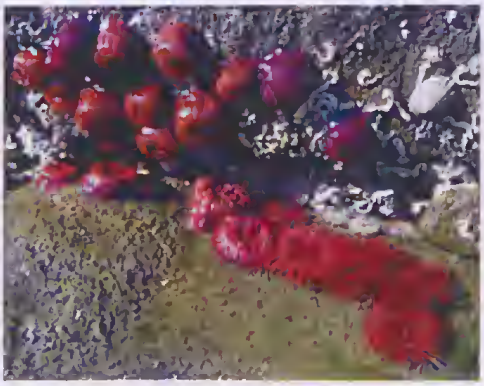
Imagine the sense of anticipation felt by the little penguin *Eudyptula minor* that left this trail on a Tasmanian beach one evening. 'Soon I can rest in my nice warm burrow'; 'soon I can see my chick again'; 'soon I can empty my overfull stomach of fish and squid'. But also 'will a quoll or tiger-snake have got there first?'

[June 2007, Bruny Island]

Wrack

Forests of giant kelp *Macrocystis pyrifera* are a feature of southern Tasmania's cool, nutrient-rich waters, where they act as keystone species because of their sheer size and structural complexity. Storms leave beaches strewn with the gas-filled pneumatocysts that in life serve to keep growing kelp buoyant. In death they provide sustenance for beach-dwelling amphipods and larvae of coelopid flies.

[December 2008, South East Cape]



Glad tidings

Both parts of the vernacular name for *Actinia tenebrosa*, the waratah anemone, refer to its flower-like characteristics. Whether in 'bud' when the tide is out, or in 'bloom' when it comes in again, these animals brighten up our temperate-shore rockpools. But don't let their beauty fool you – these are voracious predators, albeit on a Lilliputian scale.

[January 2009, Maria Island]

Shell-stealer anemone

As a shell-collector, I am regularly frustrated by my encounters with *Oulactis muscosa*. Known as the shell-grit anemone, it has a habit of gluing the most prized micromolluse shells to its exterior, only to retract its whole body and shell collection into an inaccessible rock-fissure on being touched. This specimen avoided my wrath because it hadn't captured any shells.

[January 2008, Taroona]

Underwater featherduster

Most marine organisms with delicate feeding-appendages tuck them away by day, but I found this featherduster worm *Sabellastarte australiensis* apparently feeding in the middle of the day, albeit in a shady rockpool. The slightest disturbance caused it to instantly retract its tentacles, so it took a fair bit of patience to capture it in its full glory.

[January 2010, Cape Portland]

Meet the ancestors

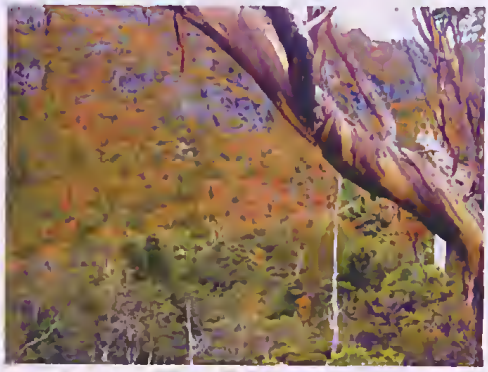
Some thirty million years separate this banded australwink *Austrolittorina unifasciata* from the fossil screw-shells protruding from the Oligocene-era rock on which it sits. Australwinks eke out a living grazing on algae and lichens in the splash-zone. Here at Fossil Bluff in northern Tasmania, they make the most of the shelter offered by these fossils in an otherwise very exposed habitat.

[January 2008, Fossil Bluff, Wynyard]

The other Tasmanian wilderness

In the nineteenth century, the grassy woodlands of Tasmania's midlands were seen as ideal country for pioneer sheep-graziers. But looks can be deceptive. This region is in a rain-shadow and receives less rainfall than some deserts. Two centuries and many droughts later, skeletons of relict cabbage-gums *Eucalyptus pauciflora* bear witness to the ecological collapse facing large parts of this landscape.

[January 2007, Hamilton]



Hidden conflict

The rocky hillside blanketed in deciduous beech *Nothofagus gunnii* in its autumn finery; the protruding King Billy pines *Athrotaxis selaginoides*; and the bough of a snow peppermint *Eucalyptus coccifera* in the foreground – this landscape could only be Tasmanian. It is also a war-zone: between the fire-adapted montane eucalypt woodland in the foreground and the fire-intolerant conifer-dominated rainforest beyond.

[April 2007, Cradle Mountain]

Nevermore

Throughout history, ravens have been associated with evil and foreboding. In Tasmania, the endemic black currawong *Strepera fuliginosa* perhaps fills this role better than any raven. However, with their exuberant, buoyant flight and their ringing calls echoing around the mountains, they also evoke a strong sense of wilderness – which in the Australian psyche can make them the good guys too.

[January 2007, Cradle Mountain]

If I can't see you then you can't see me

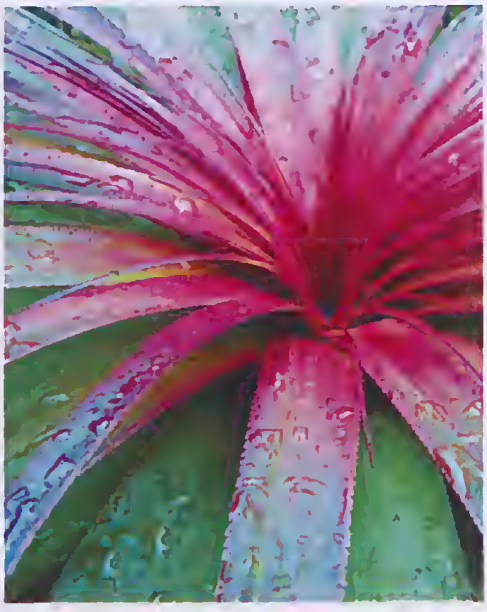
Tasmanian echidnas are furrier than their mainland counterparts, but they still present a formidably prickly prospect for any would-be predators – especially once they dig in. Much the same prospect bedevils the photographer keen on that full-frontal image of a foraging echidna, but at least there's some consolation to be taken in appreciating the aesthetics of its defensive posture.

[January 2008, Taroona]

Snow-pineapple

Montane Tasmania's *Richea pandanifolia* is an outstanding epacrid, both in stature and appearance. Trailing, strap-like leaves hug the main stem of adult plants and may reduce heat-loss and prevent snow build-up. Though 'pandani' is named for its similarity to a tropical screw-pine, this photo of a young individual is more reminiscent of a pineapple plant – apart from the snow.

[October 2006, Mount Field]



Pandani – the ideal houseplant for energy-conscious Tasmanians?

Is your potted bromeliad from Woolies looking tired? Fed up with exorbitant home heating bills? Consider a nursery-grown pandani instead! *Looks like a hothouse plant *Prefers cold, draughty conditions – makes its own insulation *Spray regularly with chilled water to avoid leaf-curl *Prefers poor soils – do not overfeed *Mature plants may outgrow your home *Remove flower-spikes before seeds attract nuisance currawongs.

[January 2007, Cradle Valley]

The writing's on the wood

The larva of a scribbler moth *Ogmograptis* sp. wrote this cryptic message as it tunnelled its way through the nutritious cambium under the outer bark of a eucalypt branch. The message is writ small towards the left, when the larva was newly hatched from its egg, but is writ larger towards the right as it neared maturity and eventual pupation.

[December 2009, Cape Pillar]

The bright side of death

You can often tell a *Eucalyptus delegatensis* tree from its lowland congener *E. obliqua* by the reddish tinge to its young foliage. The same pigments reassert themselves in old leaves as the plant decommissions chlorophyll first. In death, and backlit by the summer sun, these leaves reveal the battle-scars accumulated over a harsh life in the highlands of Tasmania.

[January 2007, Cradle Valley]

Coast horizontal

The Roaring Forties roar particularly persistently around Hurricane Heath at Cape Pillar on the Tasman Peninsula – but they haven't defeated this prostrate Cape Pillar sheoak *Allocasuarina crassa*, a species that doesn't grow anywhere else except on equally windswept headlands and islands nearby. It shares this locale with a prostrate version of *Banksia marginata*, just visible cowering behind the sheoak.

[December 2009, Cape Pillar]

Gaudy camouflage

Lamprima aurata is unusual for a stag-beetle in that it is diurnal and at home in suburbia, where it breeds in tree-stumps. This individual appeared in our back yard shortly before Christmas. Its iridescent 'colours' are not pigments but are refractive. Was it by design or coincidence that it chose to settle on a *Hydrangea* leaf sporting the same colours?

[December 2006, Taroona]

Fruits of collaboration

French botanist Jacques-Julien Labillardière collected climbing blueberry *Billardiera longiflora* during the d'Entrecasteaux expedition (1788-1791). Though he described the species himself, the genus was named in his honour by Englishman James Smith. This Napoleonic wartime *entente eordiale* was made possible by Joseph Banks, who intervened after Labillardière's expedition collection had been seized as spoils of war by the British off Java.

[February 2008, Warra]

Umbrella species

These parasol-like fruiting-bodies of *Coprinellus disseminatus* are the visible parts of a much larger organism whose mycelia snake through the stump of a dead myrtle-beech *Nothofagus cunninghamii*, extracting nutrition while decomposing the stump. Molecular and culturing studies reveal that those species producing visible fruiting-bodies represent a tiny proportion of the true diversity of fungi in a log.

[October 2009, Mount Field]

Early experiments in ethology

My nine-year-old son Ben found this imprisoned Cocky on the forecourt of a rural Tasmanian servo. Keen to cheer it up, he engaged it in a conversation with his synthetic companion, also called Cocky. Cocky 1 and Cocky 2 evidently hit it off, which made Cocky 2's subsequent departure for the freedom of the open road all the more poignant.

[September 2010, Deloraine]

A RECORD OF THE WHITE-NECKED PETREL *PTERODROMA CERVICALIS* EAST OF THE TASMAN PENINSULA, TASMANIA

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INTRODUCTION

On 4th February 2012, twelve observers boarded the *Pauletta* for a pelagic birding trip, departing from the Pirates Bay jetty at Eaglehawk Neck, Tasmania. The group left the jetty at 0720 hours and once out of the bay, headed southeast to the Hippolytes. After a brief inspection of Big and Little Hippolyte (Cheverton Rock), the group headed for the continental shelf break where three separate berley stops were made. The weather was mostly sunny with only light easterly winds of 5-10 knots and less than 1 m swell. Of the 24 pelagic bird species recorded, the highlight of the day was a single White-necked Petrel (*Pterodroma cervicalis*) observed in flight and at close range by the group on two separate occasions. The first sighting occurred at approximately 0920 hours (-43.1592, 148.233) and the second at 1215 hours (-43.1409, 148.3280). The sighting has been reviewed by the BirdLife Tasmania rarities committee, officially accepted and entered into their database.

DESCRIPTION

When the bird was first spotted, it was a considerable distance from the boat. All that could be determined with any certainty was that it was a large black and white species of *Pterodroma*. Several observers felt the bird may have been a Gould's Petrel (*Pterodroma leucoptera*). As it came closer to the boat, an all white neck separating a dark cap from a grey-coloured back became clearly visible to all, thus eliminating Gould's Petrel as a possibility.

Several observers with digital cameras were able to obtain some reasonable images during some of the bird's closer flybys of the boat. These provided enough detail to confirm the identity of the bird as a White-necked petrel, *Pterodroma cervicalis* (Plates 1 & 2). A dark grey-black cap extends below the eye with a white band that starting from the throat, extends around the bird's hind neck. Both plates show a dark bill and eye, a white forehead, chin and throat. The bird had mostly silver to dark grey upper parts, a grey tail, dark rump, dark outer primaries and greater coverts (which form a darker M pattern across the upper wings). A very pale grey collar extends from the hind neck to the breast and is most visible in Plate 1. It has mostly white under parts and wing with a narrow, black trailing edge and black tip. Also visible in Plate 1 is a short, black bar that extends towards the centre of the wing from the joint.

The Vanuatu Petrel, *Pterodroma* (*cervicalis*) *occulta*, is very similar to the White-necked Petrel, and is generally impossible to distinguish from *Pterodroma cervicalis* in the field. There is one record of the Vanuatu Petrel from a roadside in New South Wales in 1983 (Boles et al. 1985). It is worth noting that the IUCN and BirdLife International do not list the Vanuatu Petrel as a separate species but treat it as conspecific with the White-necked Petrel. Christidis & Boles (2008) and others do, however, treat these two species as distinct. In the author's opinion there are no other similar species that warrant consideration.

Plate 1. White-necked Petrel (*Pterodroma cervicalis*), east coast of the Tasman Peninsula, 4 Feb. 2012: note the very pale grey collar extending from the hind neck to the breast, and the short black bar that extends towards the centre of the wing from the joint

Plate 2. White-necked Petrel (*Pterodroma cervicalis*), east coast of the Tasman Peninsula, 4 Feb. 2012: view from above

SUMMARY

The White-necked Petrel's normal distribution in Australian waters is described in most literature (e.g. Harrison 1983, 1987; Onley & Scofield 2007) as being usually well offshore, from New South Wales and Queensland, where they are reported in small numbers each year.

HANZAB shows two reports of White-necked Petrel from Tasmania, unfortunately though, none of these are detailed in the text (Marchant & Higgins 1990). One report appears to be from the Flinders Island, northeastern Bass Strait region and the other appears to be from off the southeast coast of Tasmania. Since the sighting and an official submission were made, a photograph of this species has been found, taken by Bill Wakefield off Eaglehawk Neck on 26th January 2008. No other reference to this species being recorded in Tasmanian waters could be found. The February 2012 sighting would therefore appear to be the second authenticated sighting from Tasmania.

ACKNOWLEDGEMENTS

The trip would not have been possible without John Weigel and Tim Faulkner (the organisers), John Males (the skipper of the *Pauletta*), Andrew Walter, Els Wakefield, Franz Steinhauser, John Weigel, JJ Harrison, Maggie Mitchell, Peter Jenkins, Paul Brooks, Richard Johnstone, Richard White, Ruth Brozek & Stewart Mitchell. I wish to thank Els Wakefield and Paul Brooks for commenting on the text, and JJ Harrison for kindly allowing the use of his images and providing GPS co-ordinates for both sightings.

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71 NEW TASMANIANS

Bob Mesibov

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How are new species discovered?

If you believe the media, most new species are *expedition rewards*. Biologists bash through previously unsampled jungle, or dip their nets in previously unfished waters, and sure enough – new species are found. The media release from the sponsoring organisation says the finds are 'exciting', 'unique', 'unexpected' or something equally dramatic.

Almost as impressive are species discovered by *expert splitting*. A species thought to be widespread is revealed to be two or three species after close examination by a taxonomic specialist. This kind of discovery can also make the newspapers or the internet science feeds.

The truth is that most new species are discovered by *rummaging in collections*. A specialist visits a museum or herbarium and patiently goes through the specimens that haven't yet been identified, or checks specimens that were identified (sometimes incorrectly) long ago. New species almost always turn up during rummaging, sometimes in large numbers. This is one reason why well-curated collections are so important in biology. Another is that museums and herbaria can be home to new species that will never be found on any field trip ever again, because they're already extinct.

On Polydesmida

There's a fourth way in which new species are discovered, namely *tipping out the too-hard basket*. Let me explain...

My specialty is Polydesmida, a group of millipedes. You can learn how to recognise the named Tasmanian species from the *Tasmanian Multipedes* website (http://www.polydesmida.info/tasmanianmultipedes). You can see how these millipedes are built by visiting the *External Anatomy of Polydesmida* website (http://www.polydesmida.info/polydesmida). The key facts are that Polydesmida are distinctive, easily recognised millipedes, and that there are a lot of species worldwide. A conservative estimate would be 20 000 species.

Tasmania has 87 named native species of Polydesmida. They range in adult length from 3.5 mm to 35 mm, and can be found in all terrestrial habitats. As I showed in an article in the 2008 issue of *The Tasmanian Naturalist*, most of our Polydesmida have small geographic ranges. All but one of our natives are endemic to Tasmania.

Well, like almost every taxonomic specialist, I've put aside over the years certain specimens that probably represented new species, but which were going to be too hard to study at the time. Maybe there was only one specimen, and I wanted more. Maybe the specimens were very different from everything else, and would need careful investigation before they could be properly classified. Maybe I vaguely remembered seeing something similar in another unidentified museum lot (but where was that lot on the shelves?).

Or maybe the adults were just too small (Plate 1). Polydesmida species are distinguished from one another by the structure of the male gonopods, which are modified legs used to transfer sperm during mating. Some of the males in my too-hard basket had gonopods so small they needed to be dissected out under a microscope and examined with an even more powerful microscope.

Introducing the new species

The too-hard basket of Tasmanian Polydesmida has now been emptied and its contents sorted, with the result given in the title of this article. Most of the new species are still 'too hard' for reasons given above, especially small size. For 27 of the 71 species there is only one known male, from one locality. Another 12 of the 71 are also from a single known locality, but more than one male was collected there.

The geography of the 71 is a little disconcerting. They come from everywhere across Tasmania, not just remote or under-sampled places, and some seem to have very small ranges. How many more are there, not yet collected? Together with a number of undescribed natives in known genera (see the *Tasmanian Multipedes* website for some examples), our Polydesmida total is now about 180 species, twice the number on the named-and-described list. I wouldn't be surprised if the true total exceeds 200.

A majority of the 'too hard' Polydesmida are so bizarre they will have to be put in new genera, although all 71 seem to belong in the family Dalodesmidae. I'm afraid it'll be a long time before all 71 have names. There are only two of us Polydesmida specialists in the whole of Australia (my colleague works at the Western Australian Museum), and the focus of our work is the mainland millipede fauna.

In the meantime, the 71 new Tasmanians have been sorted to species in separate museum containers, and the relevant museums have diagnostic digital images of the 71 different gonopods. For now, the 71 are species-in-waiting: discovered, identified, but not yet scientifically described.

Plate 1. Adult female of one of the new species (scale bar = 1 mm)

IT'S A MYTH: TOUCHING ORCHID PLANTS DOES NOT AFFECT THEIR PREDATION

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INTRODUCTION

"Don't touch the orchids because, if you do, animals are more likely to eat them". This surprising instruction was given to us on several oeeasions when we were walking in the bush, both in Victoria and Tasmania. The claim means more to us now that we have aetive orchid monitoring programs at several loeations in Tasmania, where we need to handle orchid plants to make various measurements. However, try as we might, we could not think of a plausible reason why touching would lead to this dramatie effeet.

At Rubicon Sanctuary, we ean relatively easily set up experiments close to home. The property supports a wonderfully rich orehid habitat and we also frequently observe rabbits and occasionally see Bennett's wallabies, pademelons, brown bandieoots, potoroos and swamp rats. Given a suitable setting, the temptation to examine and possibly debunk a myth has increased. It turns out that our sceptieism is well founded, but as with many myths, there is often an element of truth to be found...

PROPOSITIONS

Given the statement that motivated the experiment, we set forth two propositions:

P1: (Control) Prior to any orehid specimens being touched, there would be no signifieant differenee between the damage observed in to-be-touched and to-be-untouched orehid speeimens.

P2: Significantly more damage would be observed in orchid speeimens that have been touched, compared to orehid specimens that remained untouched.

MATERIALS & METHODS

Experimental design

To examine the claim that animals will eat orchid plants that have been touched, our approach was to identify two groups of native orehids growing in their natural setting. We would deliberately toueh all the orehids in one group and not touch orchids in the other group. A total of 120 orchid plants were ineluded in the experiment, comprised of 60 specimens of two common species (Plates 1 & 2): *Glossodia major* (waxlip orchids) and *Caladenia carnea* (pink fingers). This replicated design permits limited examination of a possible speeies effect.

To reeognise the seleeted orchid speeimens and their group membership during the experiment, we installed numbered stakes near to eaeh speeimen. Stakes had flagging tape attaehed that was inscribed with specimen number plus a "T" only for specimens in the to-be-touched group. Installation of the stakes was carried out by one of us, while wearing latex gloves to avoid any item near to eaeh orchid plant being touched by human hand. On days two and three, the to-be-touehed orchids were deliberately touehed, whilc the other seleeted specimens remained untouehed throughout.

We further elaborate details about the experimental method for *Glossodia major*; the method for *Caladenia carnea* was identieal starting on 17 Oetober 2011. On day one (4 October 2011), we tied white flagging tape to the top of 60 galvanised

Plate 1. Flower of *Glossodia major*

Plate 2. Flower of *Caladenia carnea*

steel stakes and marked the tapes with two sequences of numbers, 1 to 30 and 1T to 30T. We then walked along tracks at Rubicon Sanctuary looking for flowering specimens of *Glossodia major*. For each selected specimen, we installed a numbered stake in the ground approximately 300 mm (one ruler length) from the flower, in the direction of our house. Stakes were installed in the sequence 1, 1T, 2,2T, 3, 3T ... and so on, up to 30, 30T (Plate 3). The effect of this labelling sequence is that to-be touched and untouched specimens are mixed within each group of plants, part of our effort to reduce any bias in the membership of the two groups. By the end of the walk, 60 plants of *Glossodia major* were marked with stakes, numbered 1 – 30 and 1T – 30T. We also recorded whether each specimen was growing amongst vegetation close to the track or in the open track itself. At this stage none of the selected specimens had been touched, the aim in the first instance was to acclimatise the installed stakes.

Plate 3. Stake number 28T is installed in position

On the evening of day two, we returned to each marked specimen, recording firstly whether it had been damaged. We next touched the specimen if it was marked with a "T". To touch the plant, one of us held the stem lightly with our fingers and thumb and then moved our fingers and thumb up and down the stem several times (Plate 4). We also stroked the petals and sepals between our fingers and thumb. On day three in the evening, we repeated the actions of day two: recording whether the specimens had been damaged and retouching the plants labelled "T". One week from when specimens were first touched or left untouched (day eight) we recorded again whether the specimens had been damaged and removed all the numbered stakes. The labelling method worked well; at no stage in the experiment was there ambiguity about which orchid

Plate 4. Touching a flower of *Caladenia carnea*

specimens were labelled, nor whether they were in the touched or untouched treatment group. During the week of the experiment some flowers closed up as part of their normal life cycle. This event was recorded separately from any recorded damage to the plants.

A plant was recorded as damaged if any part of any part of the flower went missing or if the plant had been dug up or had disappeared. Because the motivation for this experiment implies that plants will be wholly eaten by a mammal, we recorded separately whether damage was just to part of the flower, or whether the whole flower and some stem had disappeared or been uprooted. Damage to part of the flower is described as insect damage, but may include damage by a slug or other invertebrate, with insects sometimes being seen damaging the flowers (Plate 5). Damage to the whole plant or flower stem is described as mammal damage (Plate 6).

We also recorded the location of plants, in terms of whether they were in the open, i.e. on the edge of a track (Plate 7), or completely surrounded by natural vegetation (Plate 8). In many instances the vegetation had been previously disturbed either by slashing, burning or bracken removal in recent years, but nonetheless access to the plant was less easy for a ground-based mammal than those plants growing in or on the edge of a track.

Plate 5. A *Glossodia major* flower with damage to its petals – an example of insect damage

Plate 6. *Glossodia major* flower stem (circled) lying beside a hole with the tuber missing – an example of mammal damage

The total number of specimens that were included in the experiment is shown in Table 1.

Statistical analysis

To examine the propositions, we aggregated the data for the two orchid

Plate 7. A flower of *Glossodia major* (circled) on the open track

Plate 8. A flower of *Glossodia major* (circled) amongst vegetation

species, and performed χ^2 tests to determine whether the observed distribution of damaged specimens is significantly different from an expected distribution on the assumption that the treatment (touched or untouched) is irrelevant. While we do not explicitly include the results by individual species, we discuss instances where there is a different effect when considering one or both species separately.

RESULTS

In testing the two propositions, we examine two versions P1M/P2M and P1A/P2A. P1M/P2M (MAMMAL) focuses only on mammal damage to the flower stem, with damage only to flower segments being counted as undamaged, while P1A/P2A (ANY) includes damage caused by a mammal and insect, i.e. undamaged specimens have flowers and stems entirely intact. With this framework, there will never be more damaged specimens in the P1M/P2M analysis compared to the P1A/P2A analysis.

P1 provides a control for the main effect in P2. Between day 1 and day 2 each selected specimen has a stake installed 300mm away from it, and no specimen is actually touched. In this case we expect that there will be no significant difference in damage observed by day 2. On day 2, mammal damage was observed to two of the to-be-touched specimens and three of the to-be-untouched specimens (P1M); and any damage was observed in four to-be-touched specimens and six to-be-untouched specimens (P1A). For both propositions P1M/P1A, $\chi 2$ tests with one degree of freedom yield $p<0.05$, and proposition P1 is supported, there is no significant difference in damage observed after one day.

When considering P2 at day 8, the starting point is the number of undamaged specimens on day 2, respectively excluding 5 of the 120 initial specimens with mammal damage (P2M) and 10 of the 120 specimens with any damage (P2A), i.e. specimens with damage first noted on day 2. Tables 2 & 3 show that P2 is not supported in either form, in fact considering only mammal damage there is support for touched specimens being less damaged than untouched specimens. This significant effect is present when considering the *Glossodia* specimens, but insignificant when considering *Caladenia* specimens. This effect disappears when considering any damage to specimens.

During the experiment, we noticed that orchids growing in the open track appeared to be more vulnerable to damage

Table 1. The number of specimens touched and not touched during the experiment

	Number of untouched specimens	Number of touched specimens	Total
Glossodia major	30	30	60
Caladenia carnea	30	30	60
Total	60	60	120

Table 2. χ^2 test for P2M, considering only damage presumed caused by mammals to the flower stem

Actual	Un-damaged	Damaged	Total	*Expected*	Un-damaged	Damaged	Total
Touched	53	4	57		49	8	57
Untouched	46	12	58		50	8	58
Total	99	16	115		99	16	115
χ^2 $p = 0.034$ $p<.05$ *significant, but direction opposite from that predicted*							

Table 3. χ^2 test for P2A, considering any damage caused to plant specimens

Actual	Un-damaged	Damaged	Total	*Expected*	Un-damaged	Damaged	Total
Touched	49	5	54		46	8	54
Untouched	45	11	56		48	8	56
Total	94	16	110		94	16	110
χ^2 $p = 0.123$ $p>.05$ *not significant*							

than those growing amongst other vegetation. Given that we recorded the location of each specimen, we were able to examine the difference in damage to specimens in these two situations. For this analysis, day 1 to day 2 does not form a control, as the open/vegetation habitat of all specimens remains unchanged throughout. For this analysis, our starting point on day 1 is 46 specimens in the open and 74 specimens surrounded by vegetation. By day 2, five specimens in the open had vanished completely, considered to be mammal damage using our analysis, a further five specimens were considered insect damaged, three in the open and two in vegetation. The results of comparing day 2 (for consistency with the previous analysis and therefore excluding those specimens damaged on day 2) to day 8 are presented in Tables 4 & 5. When considering the two species separately, all four results are at least significant ($p<0.05$). When the analysis is repeated for all specimens starting on day 1 and finishing on day 8, the results become highly significant ($p<.001$) for both definitions of damage.

DISCUSSION

The results demonstrate that the instruction not to touch orchid plants for fear of them being eaten is a fallacy. However, as with all folklore, there is a real effect that people have noticed. This effect is that plants growing in the open, especially

Table 4. χ^2 test for difference between damage to specimens in the open compared with those surrounded by vegetation, considering only damage presumed caused by mammals to the flower stem

Actual	Un-damaged	Damaged	Total	*Expected*	Un-damaged	Damaged	Total
Touched	27	11	38		32	6	38
Untouched	67	5	72		62	10	72
Total	94	16	110		94	16	110
χ^2 $p = 0.001855$ $p<.01$ *significant*							

Table 5. χ^2 test for difference between damage to specimens in the open compared with those surrounded by vegetation, considering any damage caused to plant specimens

Actual	Un-damaged	Damaged	Total	*Expected*	Un-damaged	Damaged	Total
Touched	29	12	41		35	6	41
Untouched	70	4	74		64	10	74
Total	99	16	115		99	16	115
χ^2 $p = 0.000398$ $p<.001$ *highly significant*							

alongside tracks are more vulnerable to animal damage than those located away from the track. It is these specimens that are likely to be more readily noticed by people who generally follow tracks. Further compounding this natural effect is the possibility that orchid plants are being removed by human orchid enthusiasts, although it is hoped that the practice is rapidly declining.

An effect that careful readers will have noticed in our data is that a higher proportion of plants were damaged in one day (day 1 to day 2), compared with the daily average damage over the following week, especially when considering damage by mammals and insects combined. For mammals alone, 5 specimens were damaged in one day and a further 16 in the next seven days, an average of 2.28 specimens per day. For any type of damage, 10 specimens were affected in one day, and (coincidentally) 16 further specimens in the next seven days. (Included in this data is one specimen damaged by an insect on day 1 that disappeared completely on day 8.) There is therefore some evidence of an effect on damage related to the placement of stakes on day one, despite careful handling of stakes only with latex gloves. This result tends to confound the main result of the experiment.

A further proposition that ought to be considered is whether insect damage is independent of specimen location and/or handling. Five of the six observed insect attacks were prior to any specimens being touched, which further enhances our concern about the effect of disturbance when stakes are placed. Four of the six specimens that were insect damaged were amongst vegetation, which perhaps might be expected as this would provide better nearby cover for insects. These numbers are too small for reliable statistical testing.

During the eight days of each treatment, 21 flowers closed up as part of the natural

process of maturing. Of these, five closed by day 2 in the to-be-touched treatment, a statistically significant effect, all five were *Glossodia major* plants. By day 8, the closed flowers were distributed 10-11 touched-untouched and 10-11 in open-vegetated areas respectively, with clearly no significant difference in either treatment. Many more closed flowers belonged to *Glossodia major* plants overall, which may reflect the biological reality that these flowers tend to go over more quickly than *Caladenia carnea* flowers.

Limitations

Although the claim that motivated this experiment is soundly refuted by the experiment, there remains the lingering doubt that placement of the stakes has led to enhanced damage to the specimens used in the experiments. Another related issue is whether the one-day gap between placement of stakes and initial touching of plants is sufficient. This short period was chosen to limit the likelihood of flowers naturally going over during the experiment. Both of these issues are worthy of further examination in any replicate of this experiment.

As with all experiments, more experimental subjects (plant specimens) lead to more robust results. There are practical limitations to finding a suitable large population, with two of the most common species on our property being chosen for this experiment, and the date was chosen to be outside our busy orchid monitoring season. Because of the number of specimens used, some of the cell sizes are rather small (less than 5) for the χ^2 tests to be viewed as highly reliable. This is more of an issue for the analysis that considers the two species separately.

Further experimentation would be needed to see whether these findings are replicated elsewhere. Perhaps the grazing pressure from herbivores or the availability of other palatable plant species affects the rate at which orchids are damaged or destroyed. The grazing pressure could depend on the particular species and the population density of herbivores present. The higher than average rainfall in 2010 and 2011 has led to prolific growth in many plant species so herbivores may have more choice of feed and may be less inclined to eat orchids than in drier years – although in drier years orchid numbers are themselves depleted. Further experimentation in future years could investigate orchid predation in greater depth. It would also be instructive to see whether the rate of orchid damage or destruction is increased in drought years.

Conclusions

The results of this experiment carried out at Rubicon Sanctuary in October 2011 indicate that the numbers of two orchid species, *Glossodia major* and *Caladenia carnea* that were damaged or destroyed were not significantly affected by human touching of the plants. This finding is a relief to those of us that touch orchids frequently in the course of identifying or measuring them.

We did, however, find that the numbers of specimens of both species that were damaged or destroyed were significantly affected by whether they were growing in an open track or amongst vegetation. Orchids growing in the open track were more vulnerable, especially to presumed damaged by mammals, e.g. by being dug up and/or eaten by herbivores travelling along the tracks. It would be very interesting to set up cameras to confirm this presumption.

The results of this experiment reveal the possible origin of the myth that touching orchids leads to their destruction. People

looking for orchids generally walk along tracks; and the plants that they see and touch along tracks are also the ones most likely to be damaged or destroyed. This destruction is not caused by their touching them but is caused by the increased vulnerability of orchids growing along open tracks rather than amongst vegetation.

One consequence of this finding is that we may be able to increase the chance of a particular orchid surviving and perhaps reproducing by putting some vegetation around it to protect it. Some orchid enthusiasts already do this e.g. the few flowering plants of the threatened species *Chiloglottis trapeziformis* at Wynyard were protected in this way in 2010 and 2011. It would be interesting to experiment to find out what kinds of protection are most effective in different situations. The protection needs to deter herbivores but not significantly reduce light available to the plant or access by pollinators.

ON THE *POLYZOSTERIA* TRAIL – A COCKROACH OF THE TASMANIAN HIGH COUNTRY

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The cockroach genus *Polyzosteria* is relatively widespread across Australia, being represented by some 15 described species from mainland Australia and Tasmania. Perhaps the best known of these is the celebrated Botany Bay cockroach *Polyzosteria limbata*, which is a very attractive species with a bright yellow line fringing its circumference; however, the first prize for colour must go to the West Australian Mardi Gras cockroach *Polyzosteria mitchelli*, a highly decorated animal with bright yellow markings highlighting its blue/green iridescent dorsal surface. Though perhaps not as spectacularly coloured, the species recorded from Tasmania is no less an attractive animal. In the past it has been identified as *Polyzosteria limbata* (Burmeister, in Roth 1999), but perhaps more recently as *Polyzosteria viridissima* (Nuytsia on www.flickr.com/photos/nuytsia_pix/). However, *Polyzosteria limbata* is not recorded from Tasmania (Rentz 1996) and *Polyzosteria viridissima* is currently known from the Kosciuszko National Park area of New South Wales, although a recent unconfirmed record exists for Tasmania in the *Atlas of Living Australia* occurrence records. Whether one or two *Polyzosteria* species occur in Tasmania remains a mystery at present: however, both may indeed be endemic and undescribed.

During their Federation Weekend camp held at Liawenee 14-16 March 2008, members of the Tasmanian Field Naturalists Club chanced upon a quite large cockroach crossing the sand in the Carter Lakes dune system near Lake Augusta. Pictures of the specimen (Plate 1) were recorded and along with many other interesting images, placed in the public domain via the Club's website. A written record of the proceedings also appeared in the Club's quarterly bulletin number 330, but this is by no means the only time the animal had been observed or photographed (refer to www.flickr.com/photos/nuytsia_pix/ taken in 2009-2010 recorded in the same general area and probably depicting the same species).

As it turns out, the Tasmanian Field Naturalists Club's website is a popular location (and rightly so), as the 2008 field trip captured the attention of Dr Stephen Cameron (Qld. Uni. of Technology), who was particularly drawn to the image of the handsome Tasmanian roach.

Plate 1. The original image that appeared on the Tasmanian Field Naturalists Club web site that prompted the further searches for this beast (taken near Lake Augusta, 15 Mar. 2008)

A fortuitous meeting with Stephen at the Invertebrate Biodiversity Conservation Conference held in Melbourne, Dec 2011, alerted Bob Mesibov and Karen Richards to the fact that this specimen was highly likely to be an undescribed species, endemic to Tasmania. Stephen, who was presenting a paper on *Polyzosteria viridissima* at the conference, enthusiastically enlisted Bob and the

authors to attempt to obtain further specimens for description and extraction of DNA voucher material.

Prior to this field excursion, images of a specimen believed to be of the same species were sent to Stephen who confirmed its likeness: the blattarian subject, currently housed in the collection maintained by Chris Spencer, had originally been collected by Simon Fearn in 1986, however, no location data accompanies the pinned specimen. On his confirmation that this was not a described species, Stephen urged us on.

After a few false starts due to fickle weather conditions, a visit to the sand dune system west of Carter Lakes was undertaken on 25 February 2012. The search area was centred at co-ordinates 460152mE 5364990mN (GDA94). During the visit the temperature hovered around 27° and a clear sky prevailed, but, as not uncommon in the Central Highlands, this was accompanied by a dry gusty northwesterly wind. We began our search at 1000 hours. A female specimen was taken almost immediately as she scurried along the sandy access track, in close proximity to a fully opened *Aseroe rubra* with attendant flies. Over the next few hours a further four female and five male specimens were procured: we decided to call it a 'successful' day at approximately 1300 hours.

The specimens obtained were active, walking across the open sand or immobile, sunning themselves on or amongst ground cover vegetation (Plate 2). All individuals were easily captured and were found to be cryptic, camouflaging rather well with the *Macropus rufogriseus* scats that littered the ground. The roaches were taken singly and were well separated, being dispersed across an area of about 2 ha. Only two individuals of a lesser age cohort were observed, being two third's adult dimensions (25 x 15 mm). Despite intensive search effort, no nymphal animals were located.

Plate 2. A live animal *in situ*, crawling over *Grevillea australis*

Though recognised as behavioural traits of the genus, no stridulation was detected and captured specimens were not found to squirt acrid smelling fluid, even when confined in the hand for five minutes, much to Karen's relief. Sexual differentiation was ascertained by the presence of paired styles (Plate 3), located ventrally between the cerci of male animals (Rentz 1996).

Plate 3. Close-up of cerci/styles

The precise range of this species is currently unknown, but it is certainly not restricted to the collection site. Bob, an occasional visitor to the area, has previously observed the species occurring across an area of approx 10 km², including lakes Ada and Augusta as well as Ibbotts Rivulet. A search on the internet shows that specimens have also been recorded further west at Ada and Talina Lagoons (as indicated at the Nuytsia site on Flickrhivemind – Plate 4), where it has been observed apparently feeding on *Orites revoluta* flowers. This region is part of a vast area of what appears to be favourable contiguous habitat. It is therefore probable that the species is likely to be widespread and abundant.

Plate 4. An adult found feeding in *Orites revoluta* flowers along the walking track between Ada Lagoon and Talinah Lagoon, Central Plateau, Tasmania, 25 Dec. 2010

At the completion of our successful hunt, specimens were forwarded to Stephen Cameron to enable a formal description. The other specimens are destined to become resident in the invertebrate collection housed at the Tasmanian Museum and Art Gallery, much to the delight of the invertebrate curator.

This brief note was written to highlight the importance of information sharing and the power that digital media has to release information into the public domain; and in addition, to acknowledge the contribution that groups such as field naturalists make toward the pursuit of scientific knowledge (even if unknowingly).

The authors are certain that many readers will share our amazement that this large cryptic, yet highly visible and regularly encountered, animal had not been formally described. We also wonder how many other invertebrate species share this dubious distinction even though proverbially, they are right under our noses, so naturalists, keep snapping and displaying those images.

Subsequent correspondence with Stephen Cameron confirms that the collected specimens are visually very like *Polyzosteria viridissima*. However, the everted male genitalia of these specimens differ greatly from those of *Polyzosteria viridissima* and will require dissection to confirm species identity.

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COMMENTS ON THE CONSERVATION STATUS OF *SENECIO VELLEIOIDES* (FOREST GROUNDSEL) IN TASMANIA

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INTRODUCTION

The genus *Senecio*, generally referred to as groundsels or fireweeds, is one of the most species-rich genera in Tasmania, with 37 native and 4 exotic taxa (Baker & de Salas 2012). For many years the species were poorly-defined and consequently under-represented in collections in formal herbaria. However, with recent clarification of nomenclature and taxonomy (e.g. see Thompson 2006 and references therein), the identification of Tasmanian species has become easier, and many field botanists are becoming increasingly confident in assigning a name to a specimen. In recent years I have been penning some articles on individual species of *Senecio*, particularly those with an already legislated "threatened" status (e.g. *Senecio psilocarpus* – Wapstra (2010a); *Senecio georgianus* – Wapstra (2010b)) or that may warrant listing on schedules of the Tasmanian *Threatened Species Protection Act 1995* (e.g. *Senecio campylocarpus* – Wapstra (2011)). The present article is on an already listed species, *Senecio velleioides*, but is written for different reasons. This is a species that has always been well-defined and easily identified, is well-represented in formal herbarium collections, but its legislated conservation status has perhaps never matched its distribution and ecology.

Some history

Senecio velleioides (forest groundsel) was listed as "rare" (Schedule 5) on the promulgation of the Tasmanian *Threatened Species Protection Act 1995*. The basis for many of the initial listings on the Act was the information provided in *Native Higher Plant Taxa which are Rare or Threatened in Tasmania* (FAC 1994).

So how many records were there prior to 1995? The most recent information in the Department of Primary Industries, Parks, Water & Environment's (DPIPWE) *Natural Values Atlas* (NVA) database, which incorporates collection information from the Tasmanian Herbarium, indicates that there were just 23 records. These collections represented a widespread distribution (Figure 1) but there was very little ecological information available to indicate if the species was naturally rare (but widespread), simply under-collected and/or poorly surveyed, or if its distribution and abundance had already been reduced by anthropogenic activities. On this basis, a listing of rare (the lowest threat category) was probably reasonable and would allow for the species to be taken account of in land use management decisions.

What do we now know?

As with many of the so-called "rare" species on the Tasmanian *Threatened Species Protection Act 1995* initially included on the Act because of a perceived distribution, abundance or ecology that may place the species at some peril, the reality of the situation is far from that position. Unfortunately, it can take many years to gather sufficient information to reach such a conclusion, and even then it can be difficult to objectively identify the

factors that mean the species should no longer be considered "rare" and "threatened".

Figure 1. Pre-1995 distribution of *Senecio velleioides* (source: *Natural Values Atlas* data, downloaded 10.10.2012)

Figure 2. Current distribution of *Senecio velleioides* (source: *Natural Values Atlas* data, downloaded 10.10.2012); open points = pre-1995 records, solid points = post-1995 records

In the case of *Senecio velleioides*, the "real situation" is obvious to many field botanists. Many of us have pushed through dense stands of this species, colonising clearfelled and/or burnt areas of wet sclerophyll forest, acting as a pioneer species (Plate 1) along with many other typical colonisers including several species of *Senecio*. But just because a species is common at one site does not mean it is common everywhere. Lots of our genuinely threatened species can be locally abundant. In the case of *Senecio velleioides*, however, it is usually locally abundant and less commonly occurs as isolated individuals or in small populations, and almost invariably occurs in disturbed situations.

Since 1995 (i.e. post-listing as a "threatened" species), there have been an additional 26 records added to the database (i.e. about double the number), providing quite a different picture of its Tasmanian distribution (Figure 2). There are now over 30 populations identified from Tasmania. A minimum convex polygon around all records estimates the extent of occurrence as 460,330 km^2, with a maximum linear range of 293 km.

Estimating the area of occurrence is somewhat trickier because many of the database records (including herbarium collections) are not accompanied by population information. This is where personal experience is needed to "fill the gaps". My own knowledge of some sites suggests that the species can occupy 10s of hectares and number in the 1000s e.g. post-burnt coupes in the Southern Forests (Wapstra 2005; Plate 1). I have also seen the species growing within and along the edges of commercial hardwood (e.g. Simmonds Hill area on Forestier Peninsula) and softwood plantations (e.g. northeast of Scottsdale). One of the issues with the species is that it is relatively short-lived – like many colonisers of bare ground, it virtually disappears as the vegetation becomes denser and only re-appears after the next

disturbance event. This means that going back to see if the species is still at a particular locality indicated by a database is a bit meaningless. The map presented in Figure 2 is likely to change as this "geographically transient" species shifts itself around the landscape, its windblown seed taking advantage of gaps in the forest canopy.

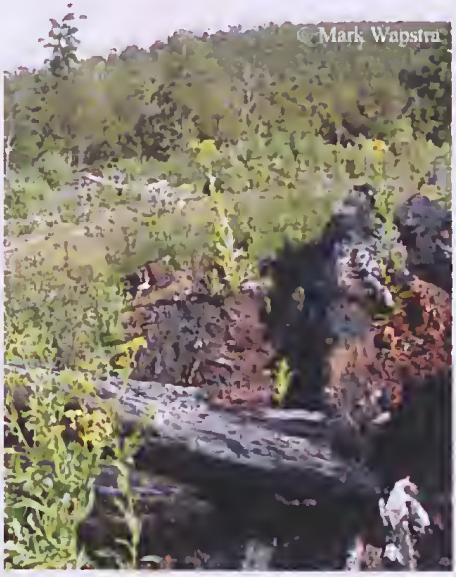

Plate 1. *Senecio velleioides* growing in a clearfelled and burnt forestry coupe near Dover

Senecio velleioides is a species of wet sclerophyll forests, a forest type long targeted for commercial wood production in Tasmania. It could be argued that forestry activities have somehow artificially increased the distribution, and perhaps the abundance, of the species. If this is the case, a reduction in commercial forestry, or a shift in the method of wood production (e.g. cessation of high intensity regeneration burns in post-clearfelled coupes), could shift the populations back the other way. Should such a variable be taken into account in assessing the conservation status of a forest-dependent species like *Senecio velleioides*? Yes, it should, but only in the context of the "original" ecology of the species. In this case, the species was always a "disturbance-phile" and the pre-1995 records probably represent a small fraction of the actual populations in Tasmania (simply a reflection of the paucity of surveys but also the transience of populations). Extensive and localised wildfires, windthrowing of isolated and large patches of trees, and maintenance of the huge network of forestry roads throughout Tasmanian wet forests will continue to occur, creating and maintaining habitat for the species.

A re-assessment of conservation status

So, do we have enough information to consider the species for removal from the Tasmanian *Threatened Species Protection Act 1995*. Fortunately, DPIPWE provides some guidelines on the criteria for listing species in various categories on the Act (DPIW 2009). The criteria for the rare category are as follows:

> A taxon of native flora or fauna may be listed as rare if it has a small population in Tasmania that is not endangered or vulnerable but is at risk. The following criteria may provide evidence of the level of threat. In order to be considered as rare at least ONE of the criteria A-B should apply.
>
> (A) A taxon of limited distribution or numbers, threatened by existing on-going processes occurring over sufficient of their range to suggest that they would satisfy the indicative criteria for vulnerable unless the threatening process was abated based on (and specifying) any one of the following:
>
> 1. the extent of occurrence is less than 80 x 80 km or 2,000 km^2;
>
> 2. the area of occupancy is not more than 0.5 km^2 (50 hectares);
>
> 3. taxa that are not A1 or A2 above, but that have very small and localised subpopulations wherever they occur

(generally no subpopulation with an area of occupancy greater than 0.01 km^2 (1 hectare) and no more than 1,000 mature individuals).

(B) Total population small or restricted and at risk in the form of EITHER of the following:

1. the total population consists of fewer than 10,000 mature individuals, and no more than 2,500 mature individuals occur on land that is in an area free from sudden processes capable of causing largely irreversible loss of individuals or habitat; OR

2. 90% of mature individuals occur in 15 or fewer subpopulations or locations and no more than 5 of these occur in an area that is free from sudden processes capable of causing largely irreversible loss of individuals or habitat.

So is *Senecio velleioides* "rare" under the criteria? The short answer is no. The longer answer is that the available evidence indicates that the species has an extent of occurrence, area of occupancy and total population abundance greater than the thresholds indicated in the guidelines for listing.

In my opinion, therefore, the key phrasing in these criteria is "rare…and…at risk". If it could be argued that *Senecio velleioides* is "rare" (which I do not think it can, as stated above), all evidence points to the species being a "disturbance-phile", often occurring in very high numbers over extensive areas of heavily disturbed ground – this does not point to a species "at risk" from obvious anthropogenic events. So is it at risk from less easily defined anthropogenic threats such as climate change? The species does occur principally in wet sclerophyll and conceivably the extent of such forest could change with a warming climate, and even changes to the Tasmanian forest industry But looking at the distribution of the species and the extent of wet forest, listing a species on the great unknown of how it may respond to such a shift (in either climate or forestry practices) is not warranted (otherwise we would need to list virtually all native flora because we simply don't know how they may respond to such factors).

The conclusion from this discussion is that while the original listing of *Senecio velleioides* as a threatened species under the Tasmanian *Threatened Species Protection Act 1995* is understandable, the species no longer qualifies as "rare" due to its extent of occurrence, number of populations, and response to disturbance.

ACKNOWLEDGEMENTS

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Addendum

Since writing this article, the author observed a massive population of *Senecio velleioides* in a recently (c. 2 years) burnt clearfelled forestry coupe off the southern end of Florentine Road, and a single specimen of the species under a quite long-established powerline easement running through open dry sclerophyll forest on South Arm, confirming the species as a disturbance-phile of various habitat types.

In addition, a serendipitous encounter of a specimen being curated at the Tasmanian Herbarium indicated a new population that was apparently eradicated as a weed from a forestry area in the central north.

Note: The author is a member of both the Scientific Advisory Committee and Community Review Committee established under the *Tasmanian Threatened Species Protection Act 1995*. This article reflects the personal opinions of the author, not of any particular government agency or committee.

HIGHLIGHTS OF PELAGIC SEABIRDING FOR 2012

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This year a small group of keen birders (James Melville, Paul Brooks, JJ Harrison and I) decided that it was important to observe the pelagic birds regularly throughout the year instead of three or four times a year as has happened in the past. In addition to the regularly scheduled trip organised by Rohan Clark and others, we organised monthly outings to the continental shelf off Eaglehawk Neck. Two vessels were hired, the *Pauletta*, a large fishing charter boat skippered by John Males that can take up to 15 passengers, and *The Big Pig*, a smaller charter vessel skippered by Stewart Nichols that can take up to five but at nearly twice the price. We chose to add in the smaller boat because it was easier to fill and would allow plenty of room for photography. However, we were disappointed when, due to bad weather forecasts, the skipper cancelled two of the trips on *The Big Pig*. The *Pauletta* was not as hard to fill as we had anticipated and proved to be more reliable even in challenging conditions.

The trip on 4 February 2012 proved to be extremely exciting with three major important sightings for Tasmania. Firstly, a White-necked Petrel *Pterodroma cervicalis*, only the second authenticated record for Tasmania! [see article by James Melville in this edition of *The Tasmanian Naturalist*] We thought it was the first authenticated record until I discovered that Bill Wakefield had photographed it on a previous trip! It remains, however, an important sighting (Plate 1).

Plate 1. A White-necked Petrel, *Pterodroma cervicalis*, spotted on 4 Feb. 2012

The second highlight for 4 February 2012 was what was first called as a Light-mantled Sooty Albatross *Phoebetria palpabrata*, which landed behind the boat on the water. This was very unusual as they usually fly past overhead and disappear, offering only a fleeting glimpse for identification. On closer inspection, it proved to be a sub-adult Sooty Albatross *Phoebetria fusca* because it had a pale yellow unguis (or stripe on the lower mandible). Light-mantled Sooties have a blue unguis and a noticeably shorter bill. A similarly light coloured sub-adult Sooty Albatross flew low over the boat on 15 September 2012 and digital images were again used to identify the species by the unguis (Plate 2). These birds breed on sub-Antarctic islands in the South Atlantic and South Indian oceans, dispersing between 55°S and 30°S, with eastward extension to Australian offshore waters and are listed as vulnerable (Pizzey & Knight 2007). This bird's beautiful plumage and elegant flight certainly gave all on board a thrill!

This was the same trip where the Shepherd's Beaked Whale was photographed and later identified by experts to be only the fourth record in the world for a live sighting of this species! [see article by Els Wakefield in this edition of *The Tasmanian Naturalist*]

Plate 2. A sub-adult Sooty Albatross, *Phoebetria fusca*, spotted on 15 Sep. 2012

The excitement was maintained when on 22 April 2012 we recorded a Great Shearwater *Puffinus gravis* from the *Pauletta*. Although ours was not the first, it was only the fourth record for Tasmania with the first being on 20 February 2011 from Eaglehawk Neck and the third and fourth being recorded out from St Helens on 6 & 10 March 2011. The Great Shearwater is an Atlantic Ocean species that does not even appear in our Australian field guides! It breeds in the South Atlantic and is a trans-equatorial migrant to the North Atlantic (Onley & Scofield 2007). It is possible that a severe weather event may have blown some of these birds out of their area. The shearwater looked enormous compared to our local Short-tailed Shearwater and very obligingly came close to the boat for some useful identification shots (Plate 3) showing the distinctive white band over the tail!

Plate 3. A Great Shearwater, *Puffinus gravis*, spotted on 22 Apr. 2012

As the weather cools, Southern Fulmars *Fulmarus glacialoides* are always a bird that is wished for and this year on 27 May 2012 we were lucky enough to have one bird, and possibly a second, right behind the boat for some time enjoying the burley (Plates 4 & 5).

Plate 4. A Southern Fulmar, *Fulmarus glacialoides*, in flight spotted on 27 May 2012

Plate 5. A Southern Fulmar sitting on water

Soft-plumaged Petrels *Pterodroma mollis* (Plate 6) are regularly seen around the boat and there was one sighted on the same trip. These birds are known to breed on Maatsuyker Island (off the southern Tasmanian coast) and have been heard arriving before the shearwaters on Goose Island over the past two years. It is possible that they may also breed on the rugged cliffs along the eastern side of Maria Island. The proposal to release Tasmanian Devils onto the island could potentially remove this breeding site.

Plate 6. A Soft-plumaged Petrel, *Pterodroma mollis*, spotted on 27 May 2012

Also on 27 May 2012, we had a Grey-headed Albatross *Diomedea chrysostoma*. This bird has a dark blue-grey head and neck cut off from the white breast and a black bill tipped pink, with a narrow golden strip along the top and bottom (Plates 7 & 8). It is classified as vulnerable.

Perhaps the successes of the early pelagic this year drew in the twitchers and helped fill the boat for we had no trouble in attracting participants! Our aim is to identify and catalogue all of the birds out there off the shelf but of course, the rarities and unusual sightings do add to the excitement. The less rare birds are also stimulating and heart-warming to see especially as conditions are now well recorded to be in a state of rapid change with as yet unknown results for the birds.

Plate 7. A Grey-headed Albatross, *Diomedea chrysostoma*, spotted on 27 May 2012

The interest and enthusiasm shown for these more frequent outings has inspired our small group to continue organising regular surveys at the shelf throughout the coming year.

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Plate 8. The Grey-headed Albatross taking off, showing the diagnostic underwing pattern

SHEPHERD'S BEAKED WHALE *TASMACETUS SHEPHERDI*: THE FIRST CONFIRMED LIVE SIGHTINGS

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THE STORY

[Recorded 4 February 2012 on a pelagic to the Australian continental shelf off Eaglehawk Neck on board the *Pauletta*, skippered by John Males and led by John Weigel]

Being on a particular side of the boat can be quite significant when on a pelagic. I was on the *wrong* side when the call went up for whales. Others could see them but I was behind a wall of excited people shouting and pointing. I immediately asked questions such as: "Are they blowing with two spouts or one?" and "How far out are they?" Luckily, JJ Harrison was able to take a few shots with his 500 mm lens and a couple on board noticed some interesting details, but all I could see was a distant movement of a pod of large looking cetaceons moving through the waves. The skipper, John Males, called out "I think they are beaked whales!" Paul Brooks was also suggesting he saw the long beak but nobody else had been able to get a good, clear view of the animals.

The image of the suspected Shepherd's beaked whale that led several marine biologists on a trail through the internet ether, drawing conclusions based on the image and first-hand observations

After the trip, the images were sent off to various experts to try to identify the animals. Because only the back had been photographed, it was difficult. Finally I thought of contacting Mark Wapstra who told us not to give up and suggested Rosemary Gales, saying that if she didn't know, nobody would! Well, we sent her the photo but even she didn't recognise it! Rosemary passed it on to Michael Double who forwarded it to Paul Ensor, the whale guru. It so happened that Paul Ensor and Michael Double were away in Bass Strait on the *Eastern Voyager*, an Australian Antarctic Division research vessel working out of Portland. He conferred with David Donnelly, Natalie Schmitt and other colleagues on board and Rosemary forwarded us their tentative confirmation:

> *"Without seeing the head or the forward flanks, it looks remarkably like Shepherd's to me. This is because of the large extent of light pigmentation on the flank behind the dorsal fin and that the*

boundary between the darker 'cape' pattern of the back and the light pigmentation slopes forward on the flanks below the dorsal fin. Dorsal fin shape and pigmentation and scars on the flanks and back are indicative of a beaked whale. Any other photos (or can the photographer recall anything else)?

There aren't many other contenders in this region (the boundary between the light and dark pigmentation on the rear flanks should have the opposite orientation for it to be True's beaked whale, Spade toothed whale has never been seen alive - pigmentation unknown). My best guess would be Shepherd's".

Rosemary Gales commented further:

"Very few people get to opportunity to see a Shepherd's Beaked Whale alive, so this is an amazing record".

A few days after our sighting, there was a news item on ABC TV showing movie footage of a pod of Bottle-nosed Dolphins, Pilot Whales and Shepherd's Beaked Whales taken in Bass Strait from the same research vessel! The newsreel reported that only three sightings [all unconfirmed] worldwide of Shepherd's Beaked Whale had ever been recorded! If this is correct, the sighting from the *Eastern Voyager* on 19 January 2012 was the fourth, ours on 4 February 2012 was the fifth, and the second sighting from the *Eastern Voyager* on 29 March 2012 was the sixth!

Michael (Mike) Double, the voyage leader on the *Eastern Voyager* in Bass Strait wrote to me:

"Many thanks for your email. Rosemary passed on your photo to me and I forwarded it to Paul for ID. Paul was on our voyage and is the true guru (along with Dave Donnelly) behind our sighting.

Mike later wrote to tell me that they had seen the whales again on their second voyage but had not had as good a view.

Soon Rosemary Gales was asking us for more details on the sighting:

"Re: your whale, we were wondering if you or others can recall anything else regarding the sighting - most importantly the head shape and colour, and if they remember a prominent light patch on the flanks behind the flippers? To see those features would be truly diagnostic and if they have some more images we may be able to say for sure".

It was clear that more details would have been useful but we only had the one image. James Melville, one of the participants on our trip, sent me an email:

"After posting the trip report for the 4th of February pelagic out of Eaglehawk Neck to the Birding-Aus mailing list - David Donnelly (who was one of the people that confirmed sightings of Shepherds Beaked Whale off Portland (VIC) with Paul Ensor), contacted me regarding our whale sighting. I provided David with the same photo that Paul Ensor reviewed, and he offered the comments below:

Based on this image alone, I would strongly suspect that this is a Shepherd's beaked whale. The image although out of focus, clearly shows the post dorsal fin pale contrasting colouration that is unique to this species. The overall dorsal colouration fits with Tasmacetus *as does the location and apparent size (6 metresish?). My only hesitation is that I cannot rule out other Ziphiids that may have a variation in colour morph, the other thing is that we have no description or images of the melon which together with what we see here, could confirm the species as* Tasmacetus*".*

David went on to provide the two images attached to this email, stating:

"The first image shows the pale melon and pale blaze (that appears over the scapular area). These two features combined are unique to this species. The second image shows (like the image you provided) the post dorsal fin contrasting pale colouration. This is also unique to this species and combined with the above features, confirms species".

Meanwhile, I had been trying to contact John Males, our skipper, who had been up the front of the *Pauletta* and had obtained a good view of the animals. Unfortunately I had been trying the wrong number but eventually I managed to reach him on his mobile. Below is what he recalled of the event:

> *"It had an unusual shape and had more of a dolphin colour rather than a whale which is usually darker. It had a lump on the top of its head and a bill like the nose of a dolphin but it was too big for a dolphin. Probably 5 to 6 metres long. I'm pretty sure there were 4 or 5 animals, definitely more than one! Only one came out more than the others and its head had a pretty pronounced forehead in its shape. Its forehead and bill looked more like a dolphin. The dorsal fin was not like a dolphin and further back. It looked like it had been in a fight or something. The whales were about 150 m away from the boat."*

Finally! This was the detail we needed to confirm our sighting. The lump on the head was the defining feature that had needed confirmation. John Males, a keen observer with many years of experience running fishing charters and sea-bird trips to the continental shelf, was able to give the best description.

SOME INFORMATION ON THE SPECIES

Description

Shepherd's beaked whale (*Tasmacetus shepherdi*), also commonly called Tasman's beaked whale or simply the Tasman whale, is a cetacean of the family Ziphidae. The species is almost exclusively known from stranded specimens and we know little else. It was first known to science in 1937, being named by W.R.B. Oliver after George Shepherd, former curator of the Wanganui Museum, who collected the type specimen near Ōhawe on the south Taranaki coast, North Island, New Zealand, in 1933. Adults can reach lengths of 6 to 7.1 metres and weigh about 2.32 to 3.48 tonnes. At birth they may be about 3 metres long. They are robust and large-bodied for beaked whales, having a bluff melon and a long, dolphin-like beak. It is the only species of ziphiid with a full set of functional teeth (17 to 27 pairs in both the upper and lower jaws). Adult males also have a pair of tusks at the tip of the lower jaw. They are dark brown dorsally and cream-colored ventrally, with a pale band extending up from the flipper and another pale area extending as a swathe on the posterior flank. The tall, falcate dorsal fin is set about two-thirds the way along the back. The colouring is distinctive for ziphiids, dark grey dorsally with white ventral field extending towards the back on both anterior and posterior sides of the flippers and on the side of the face just below gape and eye (description modified from *Wikipedia* entry based on various references including Jefferson et al. 2008 and Mead 1989).

Distribution

The Shepherd's Beaked Whale *Tasmacetus shepherdi* is one of the least known cetaceans in the world, currently represented by approximately 42 stranding records and a small number of live sightings, with the three in Tasmanian described here as probably the first confirmed live sightings. Although there have been five published accounts of possible live sightings of *T. shepherdi*, virtually all lack convincing details. However, it is possible that the species may be somewhat more widespread than the records suggest, since it was not likely to be accurately identified at sea until its recent re-description (Pitman et al. 2006). Most of the strandings have been from New Zealand (including the Chatham

Islands – 24 records), but also the Juan Fernandez Islands (2), Argentina (7), Tristan da Cunha (6) and Australia (3) (Pitman et al. 2006). There is one Tasmanian stranding record of the species: a juvenile found on Friendly Beaches on the east coast in 2003 (Rosemary Gales pers. comm.).

Based on stranding records and the known habitat preferences of beaked whales in general, *T. shepherdi* is assumed to have a circumpolar distribution in deep, cold waters of the Southern Ocean.

ACKNOWLEDGEMENTS

Thanks to John Weigel and Tim Faulkner (the organisers of the pelagic), John Males (skipper of the *Pauletta*), Andrew Walter, Franz Steinhauser, JJ Harrison, Maggie Mitchell, Peter Jenkins, Paul Brooks, Richard Johnstone, Richard White, Ruth Brozek and Stewart Mitchell (pelagic participants). Thank also to James Melville, Mike Double and Rosemary Gales for comments on the text, to JJ Harrison for kindly allowing the use of his images and providing GPS co-ordinates for the sighting, and to Mike Double, Paul Ensor, Rosemary Gales and colleagues for pursuing the identification trail.

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THE VALE OF BELVOIR – A VERY SPECIAL VALLEY NEAR CRADLE MOUNTAIN

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INTRODUCTION

The Vale of Belvoir is a large open limestone valley located about 15 km NNW of Cradle Mountain, in the lee of the Black Bluff Range. It is about 10 km long by 2 km wide, trends NE-SW, and has an open grassy floor flanked by strips of ancient rainforest and eucalypt forest. There are many important botanical, geological, geomorphological, historical, zoological and cultural aspects associated with this valley, and it has a special welcoming ambience that has endeared it to many people (Plate 1). Cattle have been summer-grazed at 'the Vale' for over a century. The Tasmanian Land Conservancy has recently purchased the grazing property in the centre of the valley from the Charleston family, but grazing will be allowed to continue because of its apparent beneficial effects on the floral communities.

© Corbett family collection

Plate 1. View of the southern part of the Vale of Belvoir from Daisy Hill, with Mt Beeroft behind (note Cradle Mountain Link Road crossing the valley)

History

The Vale of Belvoir was named in 1827 by Joseph Fossey, after the well-known valley of that name in Leicestershire, England. Fossey was on a surveying expedition for the VDL Company, looking for a stock route from Mole Creek to their holdings at Surrey Hills, south of Burnie. The route delineated by Fossey and Henry Hellyer, the other VDL surveyor, was via the Middlesex Plains and Vale of Belvoir, thence over the Black Bluff Range towards St Valentines Peak. The route became known as the 'Western Road' or 'VDL Road', and was used to drive cattle herds, and for general access, for about 30 years. It followed an earlier aboriginal track, also sited to take advantage of the open country south of the belt of dense forests which extended to the north coast (see Haygarth 1998).

Cattle were grazed in the area from about the 1850s, firstly by the Field family, then by George Moon (who built the first hut camp at the Vale in the 1880s), then by the Williams family from Narrawa, near Wilmot. George Williams also ran a summer dairy herd and operated a cheese factory at the Vale in about the period 1915–1935. The discarded whey from the cheese-making was apparently very popular with the local thylacines and tiger snakes! (unpubl. historical notes from Lisa Charleston 2008). Another unusual venture in the area was by a Canadian, Percy Davis, who bought land for farming at Lake Lea in the 1890s and tried to grow a crop of wheat in ploughed ground near the southern shore.

The Charleston family from Wilmot took over the grazing leases from the Williams through the 1960s, and continued the general grazing practices, including mosaic burning of the grasslands. The present small house and stables, located in a sheltered side valley on the eastern side of the Vale, were established in about 1975. The annual cattle drives from Wilmot and back were memorable events for the family. The family sold the 473 ha Vale property to the Tasmanian Land Conservancy in 2008, retaining the right to continue summer grazing as part of the agreement. Research conducted over many years by botanists with the Department of Primary Industries, Parks, Water & Environment (and its various former incarnations) and the University of Tasmania on the impact of grazing and burning on the grasslands has shown that the practices are generally beneficial to biodiversity, in part by maintaining the openness between the tussocks that allows the smaller flowering plants to thrive. The grazing lease areas around the freehold blocks are now incorporated into the Vale of Belvoir Conservation Area.

Geology and geomorphology

The Vale of Belvoir lies at an average altitude of 800 m, giving it a sub-alpine character. It is underlain by Ordovician limestone (about 450 million years old) – the same 'Gordon Limestone' that forms most of the other large limestone valleys in the State, e.g. at Mole Creek, Gunns Plains and the Florentine Valley. However, those are all lowland valleys, at around 400 m, so that the Vale represents the only large sub-alpine limestone valley in the State. Lying beneath the limestone is a formation of siliceous sandstone, quartzite and conglomerate – the same unit that forms the West Coast Range – and both formations have been folded to form a broad *syncline* or elongate basin, which forms the valley, with *anticlines* of the siliceous rocks rising up on either side to form the Black Bluff Range and Bonds Range (Figure 1).

About one third of the valley has been infilled with **basalt flows**, of Tertiary age (about 20 million years ago), which buried

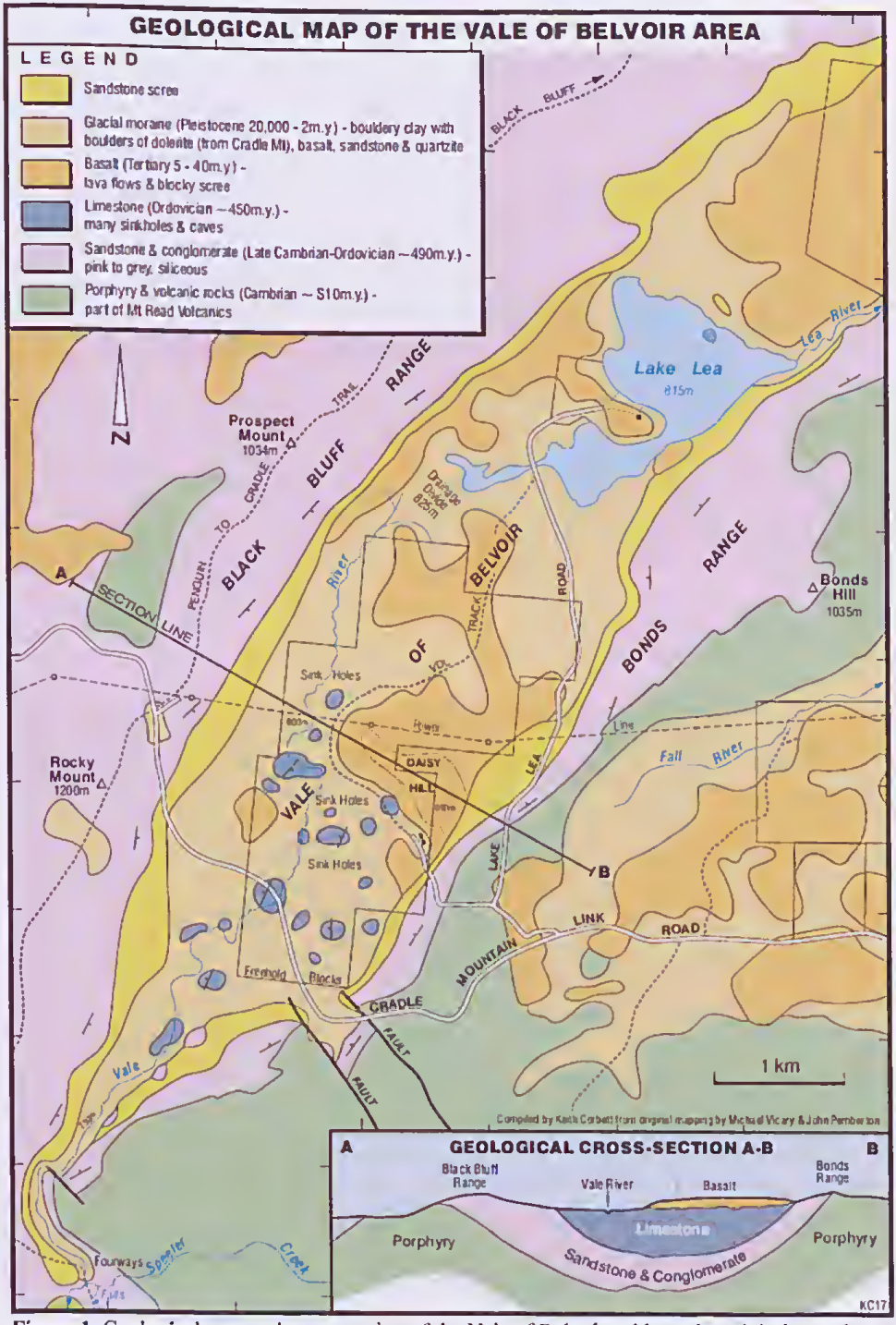

Figure 1. Geological map and cross-section of the Vale of Belvoir, with roads and drainage shown (the freehold area now owned by the Tasmanian Land Conservancy is indicated)

much of the irregular limestone topography. The basalt flows form a 100 m high dome-shaped hill in the middle part of the valley, now called Daisy Hill, a smaller hill on the western side of the valley, and several large hills at the northern end. The basalt has been spread around the valley floor during the third phase of the geological history, when a small ice sheet, spreading out from the Cradle Mountain area in the early or middle part of the Pleistocene Ice Age (0.5–2 million years ago), picked up and redistributed many basalt boulders. This ice sheet also carried and deposited many boulders, or erratics, of dolerite from Cradle Mountain, as it ground its way across the valley and up the western flank, where it finally melted. So the valley floor now has a semi-continuous cover of bouldery glacial moraine, rich in basalt boulders in many places, in between the outcrops of limestone bedrock. This 'sweetening' of basalt has improved the soil fertility, and may be part of the reason for the extensive grass cover.

As in our other limestone valleys, there are numerous sinkholes and caves across the floor of the Vale. The sinkholes are typically 10–20 m across, with grassy to muddy walls and floor where the surface soil has collapsed into the top of the cave beneath. Many have wombat burrows on the sides, hinting at the very large population of these, and other marsupials, in the valley. Some of the sinkholes have exposed limestone sides, and some have permanent ponds or small lakes in them. Several have water bubbling up and flowing out one side, with impressive water plants in some cases. Platypuses live in some of these ponds.

The bi-directional drainage of the valley is unusual, and is probably a result of the basalt flows. At the northern end is the picturesque Lake Lea, which flows out northwards via the Lea River into the Iris-Wilmot system and eventually into Bass Strait. The south-flowing Vale River drains the main part of the valley, eventually flowing into the Pieman River on the West Coast.

Vegetation

The Vale of Belvoir is an exceptionally rich place botanically. It supports one of the most extensive areas of montane grassland in the State, possibly related to early aboriginal burning, including considerable areas of rare vegetation communities of great conservation value. It is also a 'hotspot' for a number of rare and threatened species, including some beautiful flowering plants. In addition, it is now recognised that the Vale provides perhaps the most spectacular flowering of mountain daisies anywhere in the State, and the walk over Daisy Hill during flowering time in late January to early February has become a very special botanical experience (Plate 2). This is mostly due to the swathes of orange everlastings (*Xerochrysum subundulatum*), which blaze across the hill and around many of the slopes. In places these are mixed with sweeps of the rare white grassland paperdaisy (*Leucochrysum albicans* var. *tricolor*), and another common associate is mountain rocket (*Bellendena montana*), either with its creamy flowers or later red seedpods. Fields of *Bellendena* are also a feature of the Lake Lea area.

Other striking flowers to be seen are the white snowgentians (*Gentianella* species) in January, several yellow daisies (*Podolepis jaceoides*, *Leptorhynchus squamatus*, *Coronidium scorpioides*), and pink triggerplants (*Stylidium graminifolium*), while *Richea scoparia* and *Boronia citriodora* put on a show on the surrounding ridges.

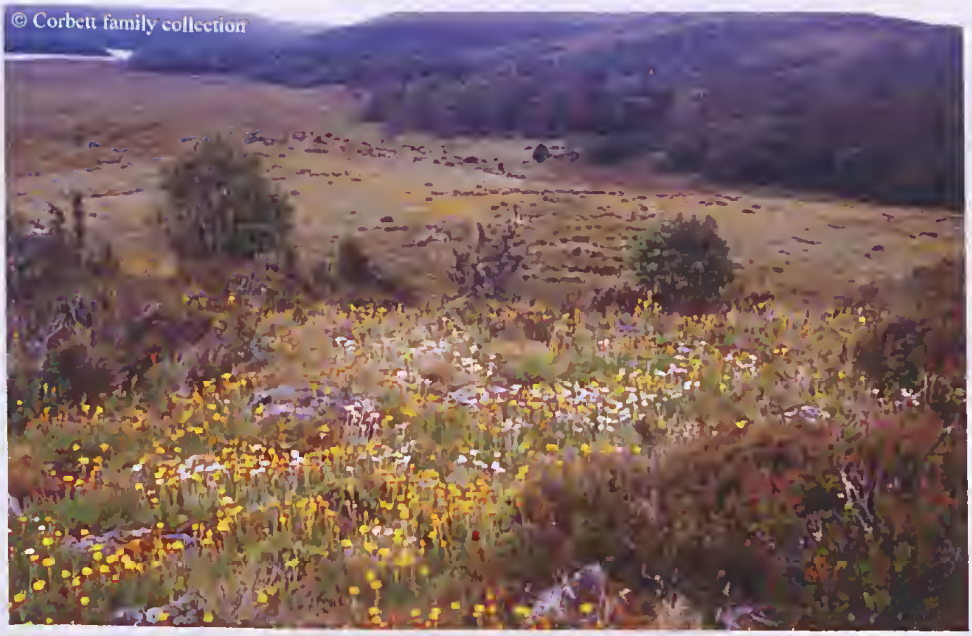

Plate 2. View north from Daisy Hill to Lake Lea, with flowering daisies (orange everlasting and grasslands paperdaisy) amongst basalt boulders (note rainforest along sides of valley)

Plate 3. Vale River flowing through limestone outcrops, with *Baloskion* sedgeland, grassland, daisies and trigger plants

Three of the main grassy communities in the valley are rare: (i) Highland *Poa* grassland, classified as Rare and Endangered, in which *Poa labillardierei* (silver tussockgrass) and *Poa gunnii* (gunns snowgrass) dominate, with other grass and sedge species and some important inter-tussock herbs such as *Stylidium graminifolium*, *Viola hederacea*, *Gentianella diemensis* and *Euphrasia collina*; (ii) Highland sedgy grassland (Rare), which is dominated by the sedges *Lepidosperma filiforme* and *Carex gaudichaudiana*, with the rush species *Baloskion australe* (Plate 3) and *Eurychorda complanata*, plus *Poa* species and *Gleichenia alpina* (alpine coral fern); and (iii) Subalpine *Diplarrena latifolia* rushland (Rare), which is dominated by the western flag-iris, extends over many of the slopes and low hills (e.g. Daisy Hill), and includes many small flowering plants between the tussocks. Large areas of buttongrass vegetation are also present on the valley sides, particularly in the southern part of the valley, and add to the rich golden colour which suffuses the Vale.

A number of forest and woodland communities are also present along the sides of the valley, and partly fringing Lake Lea. They include patches of superb ancient rainforest dominated by myrtle and sassafras, with open understorey, *Eucalyptus coccifera* (snow peppermint) forest, and open woodland with *Eucalyptus gunnii* (cider gum).

Of the rare and endangered species present, the most spectacular are the daisies *Leucochrysum albicans* var. *tricolor* (grassland paperdaisy), with white flowers and pink bracts (Plate 4), and the rather similar *Rhodanthe anthemoides* (chamomile sunray). Recent surveys indicate that the former has its biggest population in the State at Daisy Hill, while the latter typically grows on limestone banks, including along the Vale River.

Plate 4. Grassland paperdaisy (*Leucochrysum albicans* var. *tricolor*)

Other rare plants at the Vale include: *Stackhousia pulvinaris* (alpine candles), a small matted herb with star-like white flowers, mostly found in sinkholes (Plate 5); *Muehlenbeckia axillaris* (matted lignum), another small groundcover with fleshy leaves and white flowers; *Viola cunninghamii* (alpine violet); *Argyrotegium poliochlorum* (greygreen cottonleaf); and *Scleranthus brockiei* (mountain knawel). Unusual leek-orchids (*Prasophyllum tadgellianum*, *P. alpinum*, *P. sphacelatum* and others) are also present.

Plate 5. *Stackhousia pulvinaris* (alpine candles), a small herb typically found around the margins of shallow sinkholes

Other rarities at the Vale

In addition to the many rare plants and plant communities, the Vale of Belvoir is home to perhaps the biggest population of the rare and vulnerable ptunarra brown butterfly (*Oreixenica ptunarra*). This rather unassuming orange-brown butterfly (Plate 6) is endemic to Tasmania, and lives only in *Poa* tussock grassland – a fast diminishing ecosystem. They only fly for about three weeks each year, in March, on warm sunny and still days, and they're not very good flyers. Recent surveys at the Vale suggest that there is a thriving population of ptunarra browns throughout the valley.

Plate 6. Female *Oreixenica ptunarra* (ptunarra brown butterfly), a delightful member of the Vale community, resting on the orange flowerhead of *Xerochrysum subsundulatum*

Other rare species in the area include the spotted-tailed quoll, Tasmanian devil, wedge-tailed eagle, tussock skink, and of course the thylacine (common in the mid-1900s but not seen for a while now). Wombats, wallabies and pademelons also thrive here, but there don't appear to be any rabbits, and indeed very few introduced weeds. Surveys of the wildlife, large and small, at the Vale are continuing, under the auspices of the Tasmanian Land Conservancy, and it seems likely that other rarities will be discovered.

CONCLUDING REMARKS

It is clear that the Vale of Belvoir is a very special place for many reasons. Even without the many rare and threatened small things, there is a special feel and atmosphere about the Vale, with its sense of calm and welcome and timeless serenity, against the backdrop of Cradle Mountain and the rugged hills. We are fortunate indeed that the Charlestons and other families who have used the Vale have done so with care and love, that no large developments have been done – the only 'scars' are the Cradle Mountain Link Road, which crosses the valley, an HEC transmission line, which also crosses the valley, and the road into Lake Lea from the eastern side – and that the Vale property is now in the hands of the Tasmanian Land Conservancy, who are very conscious of the many conservation values and the need for careful long-term management. The TLC encourages people to visit and enjoy the Vale, but you should contact them at 03 62 25 1399.

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RISING AT THE BREAK O'DAY

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It's complicated

That's the best way to describe the relationship between the amount of rain falling on a catchment, and the flow of water in the stream draining that catchment. Sit back for a moment in your naturalist's armchair and think about some of the factors involved.

First, there's vegetation. In a bare desert catchment, a sudden heavy downpour will wash quickly over the ground, and the streamflow will increase quickly. In a densely forested catchment, a lot of the rain will be caught up in the vegetation, and won't reach the stream for a while, so the increase in streamflow after a sudden downpour will be gradual.

Next, there's soil type and depth. Some soils will soak up a lot of water, releasing it downslope very slowly. Other ground surfaces will shed raindrops like a duck's back.

The soil's moisture content plays a big part in the streamflow story. After a long dry spell, it might take a lot of rain before the ground fills with water and allows additional rain to flow to the stream.

Then there's catchment topography. Steep slopes mean quick runoff, shallow slopes mean slower runoff.

We can also throw in the spatial variability of rainfall. A heavy rain on one part of the catchment is likely to have an effect on streamflow different from that of the same amount of rain falling on another part of the catchment. Why? Because the factors noted above will vary across the catchment landscape, but the runoff all goes to the same stream.

Playing with numbers

Hydrologists are sometimes brave enough to build mathematical models of particular catchments, like those containing reservoirs and flood-prone basins. The models are meant to answer questions like: *We've had 200 mm of rain in the last 48 hours. How much additional water will flow into Mumbeegumbee Dam?*

Since you and I are naturalists, not hydrologists, we're allowed to have a theory-free look at real rainfall and streamflow numbers. What actually happens to streamflow after a heavy rain?

Tasmania has a particularly good area for this kind of data exploration, namely the Break O'Day River catchment. I wrote about the extraordinary rain and hydrology in this area in the 2001 issue of *The Tasmanian Naturalist* (Mesibov 2001). The key point is that the top end of the Break O'Day drainage, around St Marys, gets the most intense rainfalls in Tasmania, sometimes with long dry spells between rain events. In this article we'll look at the years 2010 and 2011, using daily rainfall figures from Cornwall. The streamflow data come from the gauging station by the Killymoon bridge on the Break O'Day River, about 8 km from Cornwall; flows are automatically recorded there every 15 minutes.

Overview

Figure 1 shows the raw data. What's obvious at a glance is that – as promised – Cornwall got some colossal downpours over the two years. I've numbered five of

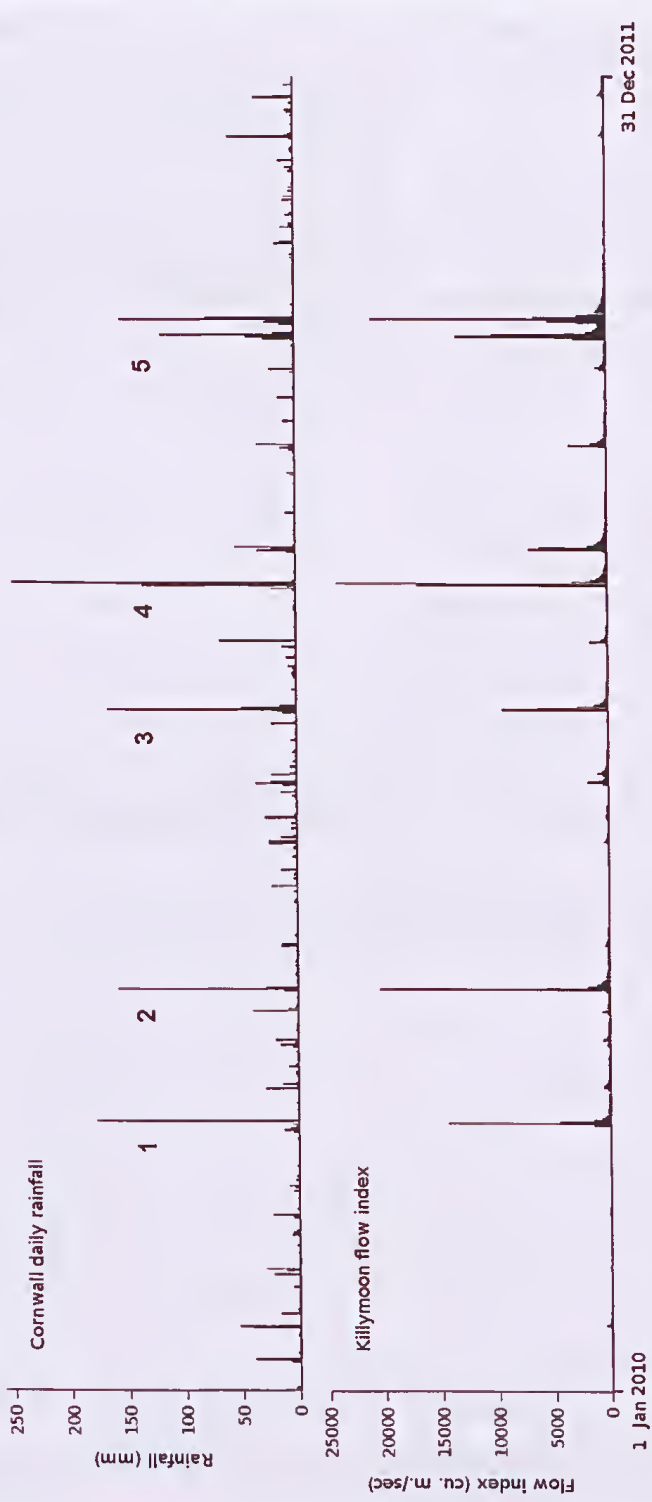

Figure 1. (top) Rainfall totals at Cornwall. The spike at event 1 was accumulated over 2 days. For events 2-5 and the minor events, accumulations are 1-day totals. (bottom) 'Flow index' at the Killymoon bridge gauge, calculated by simply adding together the 96 readings taken every 15 minutes during each calendar day

these rain events in the figure. What's also obvious is that the Break O'Day River tracks these events with near-synchronous spikes in streamflow.

Event 1 lasted about six days beginning 23 May 2010, with about 85% of the rain falling on 28 and 29 May. Almost no rain was recorded over the following two weeks. The river increased its flow rapidly and hugely (Figure 2).

Although the flow dropped rapidly after the rain had passed, it had still not yet reached its pre-Event 1 level before the next input from a rain event, on 17 June (Figure 3).

[Figures 2 & 3 are *hydrographs*. Professional hydrologists have technical names and explanations for the different parts of the curve. If you're keen to learn the jargon, start with the 'Hydrograph' article in *Wikipedia*.]

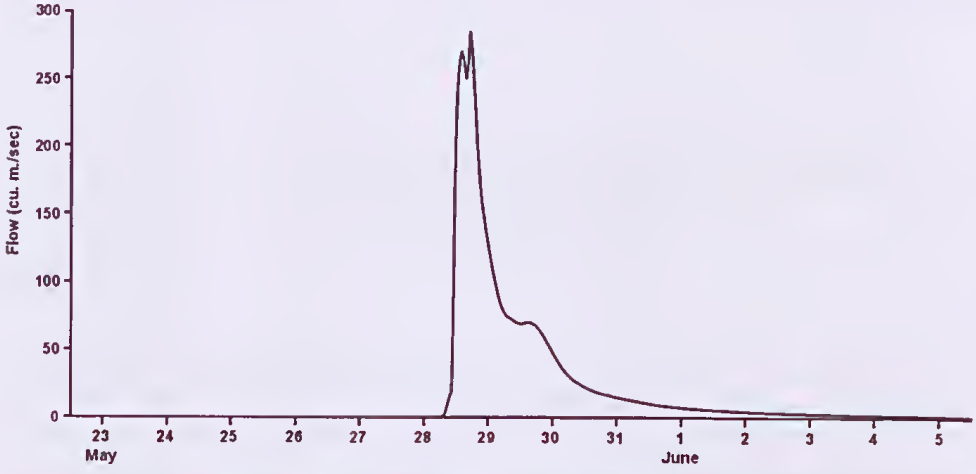

Figure 2. Flow gauge readings at Killymoon bridge, 2010. Dates are marked at 12 noon. The flow before the heavy rain was about 0.2 cubic metres per second.

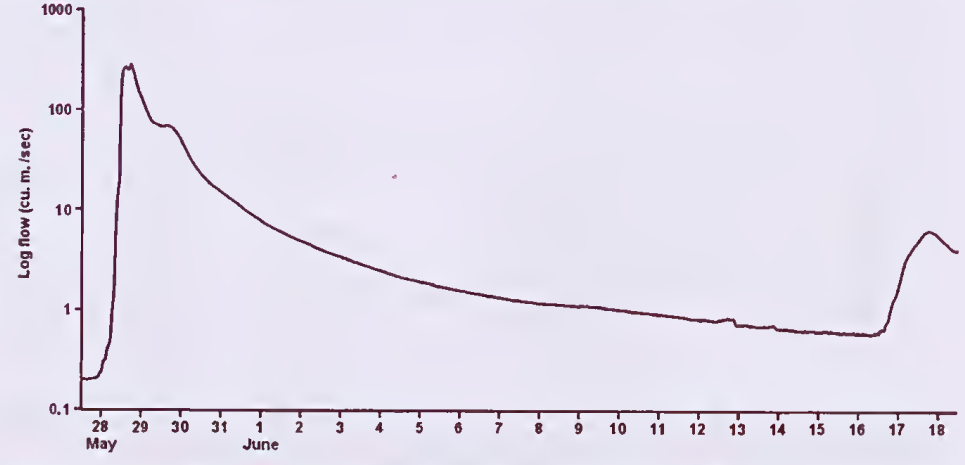

Figure 3. Flow gauge readings at Killymoon bridge, 2010, on a logarithmic scale. Dates are marked at 12 noon.

Big rain means a big river

We can estimate the additional amount of water in the Brcak O'Day River following Event 1 as the area under the curve in the figures above, after subtracting from the curve the flow before the rain event. We can also cut off the tail of the curve at midnight on 17 Junc; the little bit missing won't affect the total, which is 22.0 million cubic mctrcs.

If we repeat this exercise for Events 2, 3, 4 and 5, we get:

Event	Total rain (mm)	Extra water (millions of cubic metres)
1	209	22.0
2	198	28.0
3	257	19.5
4	418	44.2
5	506	70.7

Plotting these figures we get Figure 4, which despite all the complications noted at the beginning of this article, doesn't look too bad for rulc-of-thumbing: for every 100 mm dumpcd on Cornwall in a big rain event, about 12 million extra cubic metres of water flow under Killymoon bridge.

You could improve and extend this analysis by looking at more past 'big rain' events, and by combining Cornwall rainfall totals with those from other recording stations in the St Marys area. And if you get really interested in the rain/streamflow relationship, become a hydrologist!

Note. Daily totals for rainfall recording stations are freely available through the Bureau of Meteorology's Climate Data Online service, http://www.bom.gov.au/climate/data/.

Tasmanian stream gauge data are freely available from the Water Information System of Tasmania website, http://water.dpiw.tas.gov.au/wist/.

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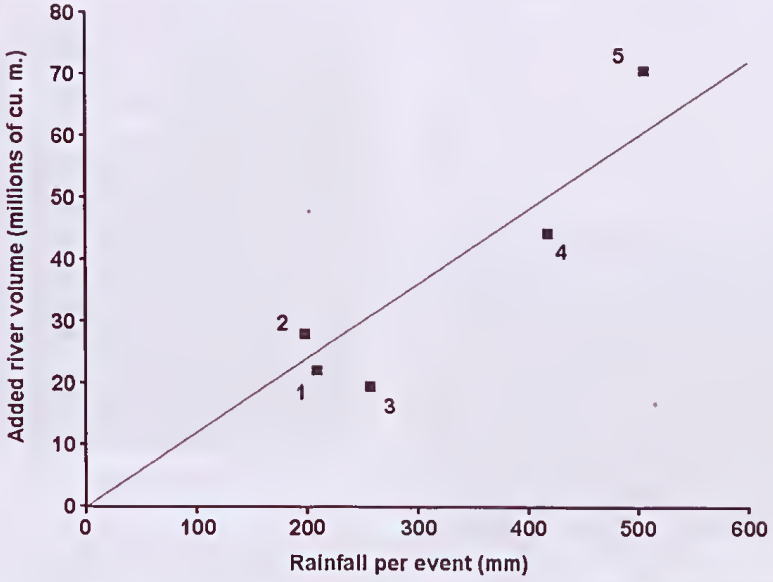

Figure 4. Cornwall rain event totals as predictor of added river volume at Killymoon bridge (fitted line has been forced through zero)

FURTHER ORNITHOLOGICAL OBSERVATIONS FROM GOOSE ISLAND, BASS STRAIT, 2011–2012

Els Wakefield[1] & Bruce Robertson[2]

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This article follows the initial report by Wakefield et al. (2010) of ornithological and botanical observations from Goose Island.

Dr Bruce Robertson and Els Wakefield spent just over three weeks on Goose Island, Bass Strait, from the end of October to late November 2011 in order to continue Bruce's ongoing studies of the world's largest breeding colony of Pacific Gulls *Larus pacificus*. This year the Pacific Gulls on Goose Island appeared to be doing better than they did last year but not as well as they did back in 2005–2006.

This year most of the pairs of Pacific Gulls were back to laying their usual clutch of two eggs with some nests having three eggs and a few with just one egg. Most of the eggs were back to being laid at two-day intervals but a few pairs took three days to lay their second egg. For the first time ever we recorded two pairs taking five days before the second egg appeared. Egg sizes were generally back to normal but we did come across one miniature egg, which probably contained only a yolk.

[see Plates 1-5 for an illustration of the various stages of the breeding cycle of the Pacific Gull on Goose Island – all images are © Els Wakefield and taken Nov.-Dec. 2009 & 2011]

Plate 1. Setting of the main breeding colony of Pacific Gulls on Goose Island, the lighthouse in the background

Overall there appeared to be slightly fewer pairs of Pacific Gulls nesting this year than there were last year. The exact reason for this is not known but there are a few possibilities. This year there has been a significant dieback of a yellow fireweed daisy, *Senecio pinnatifolius*. This plant is a true annual and last year, due to the dry conditions on Goose Island, it went to seed early and died back, leaving just dry, brittle stalks. The plants that grew this year were short and stunted, offering little protection for the eggs and chicks.

Plate 2. Two eggs in a nest of the Pacific Gull

We also know from work done on Pacific Gulls on Chalky Island, Bass Strait, in the late 1970s and early 1980s that pairs do not necessarily breed every year. So the

drop in numbers breeding on Goose Island this year could be due to just chance alone.

Plate 3. An adult sitting on a nest

Plate 4. Hatched chicks (3) of a Pacific Gull

Plate 5. An adult gull stands guard

The breeding cycle for most birds is strongly correlated with the quality and quantity of food that is available. We still do not really know what the diet is for Pacific Gulls on Goose Island but if food has been limited, this would impact negatively on their breeding.

Pacific Gulls breeding in the Furneaux Group have three different nesting strategies: (1) nesting as isolated solitary pairs; (2) as a loose colony; or (3) in a tight colony. The question that we were looking to answer this year was: *which birds nesting on Goose Island this year nest first?* The answer is that the birds in the tight colony nested before the pairs in the loose colony and before the isolated solitary pairs.

In addition to monitoring the breeding Pacific Gulls, daily observations of other birds on the island were recorded. Introduced species were Sparrows, Starlings, Blackbirds, Goldfinch and Greenfinch that were all particularly numerous amongst the african boxthorn (*Lycium ferocissium*). These bushes also hid native species such as Brown Quail, Little Grassbirds, Silvereyes, New Holland Honeycaters and Lewins Rail. A Soft-plumaged Petrel was heard, re-confirming its presence on the island since its first recorded occurrence in 2009 when three birds were heard.

Up to three pairs of Swamp Harrier and two Brown Falcons patrolled from the air. A White-breasted Sea-eagle traversed the island a few times. Dead or freshly killed birds found were White-faced Storm-Petrels, Little Penguins, Short-tailed Shearwaters and a single White-faced Heron. Two adult Pacific Gulls were found dead in the main breeding colony. Waders included two Hooded Plovers, a Red-capped Plover, some Ruddy Turnstones and Masked Lapwings. Skylarks, an introduced species, hovered and sang above the island and Australasian Pipits and White-fronted Chats, both native species, distracted us from their nests.

The most exciting records were of a male Satin Flycatcher that was seen twice, presumably the same bird, but a few weeks apart. Then we had three Blue-winged

Parrots and a group of four Orange-bellied Parrots fly over. A Sacred Kingfisher was glimpsed sitting on a stick below the boxthorn bushes. A solitary Common Bronzewing was seen clearly by us both on top of a boxthorn bush, a rare record of this species for Goose Island. Two Chestnut Teal roosting at night on a beach and a small group of Mountain Duck flying over were the only ducks seen. A party of Australasian Gannets flying as a squadron, shining white against a heavy, grey sky also caused some excitement, as did a large group of Great Cormorants flying up and down the island.

There were signs of breeding Sooty Oystercatchers and Caspian Terns as well as a large group of Crested Terns and a small flock of Fairy Terns exploring for nest sites. The Black-faced Cormorants roosting on their favourite rocks along the coastline during the day all gathered on Little Goose Island at night in sufficiently large numbers to justify Goose Island being declared an IBA (Important Bird Area). A few Silver Gulls had established a small breeding colony south of the lighthouse. Cape Barren Geese formed small groups of young accompanied by one or two chaperoning adults and there were a few stripy chicks hiding amongst the boulders. Large groups of geese often sat on the water and grazed along the shore, reminding us of the origin of the name of this beautiful island.

We hope to be able to continue this valuable long-term study of the Pacific Gulls and other wildlife on Goose Island next season and into the future.

ACKNOWLEDGEMENTS

We wish to thank all those on Flinders Island who have given us so much support with this study.

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FEDERATION WEEKEND: MURRAYFIELD STATION, BRUNY ISLAND, 28–30 OCTOBER 2011

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The Tasmanian Field Naturalists Club hosted the 2011 Federation Weekend at Murrayfield Station on northern Bruny Island. Murrayfield Station is owned by the Indigenous Land Corporation and managed in partnership with the Weetapotah Aboriginal Corporation. One of the aims for the property is to balance the demands of running an established sheep and fine merino wool business with protecting cultural and environmental values.

Field naturalists from the Launceston, Northeast and Hobart clubs began arriving at the property during the afternoon of Friday 28 October 2011. A white-bellied sea-eagle (*Haliaeetus leucogaster*) marked the occasion of our arrival by soaring over our quarters. The weather was remarkably warm and sunny, which was in contrast with the early morning rain. Early arrivals took advantage of the weather and strolled down to the foreshore; some even ventured into the water. Children enjoyed their freedom to roam the open spaces and gambolled about like the lambs in nearby paddocks. Tents began to spring up in the paddock across from the shearer's quarters. Most field naturalists had arrived by 6 pm and the kitchen area became a hive of activity; people dodging and weaving around each other with good humour.

The first official engagement of the weekend was a welcome and an introduction to the Murrayfield Station by Bruce Michael, the manager of the farm. He explained the ownership of the farm and how it is managed. It provided opportunities for Tasmanian Aboriginal people to gain skills in farming and environmental management and to learn more about their culture. Many school children visited the farm. Bruce said that groups such as ours were welcome to come and use the property to learn about the property and its values. He also explained about their environmental commitments. Surveys of plants, geodiversity, cultural heritage, birds and mammals had been organised and completed and reports from these surveys provide advice for management. As a consequence of the vegetation management plan, coastal areas, grasstrees and habitat for forty-spotted pardalotes had been fenced from stock.

Field naturalists braving the inclement weather to explore a cobble beach and surrounds

Following Bruce's talk, Michael Driessen gave a short introduction to mammals of Tasmania and Bruny Island and summarised the results of a mammal survey undertaken by the Department of Primary Industries, Parks, Water & Environment in August 2010. Ten mammal species were recorded on the property during the survey comprising seven native and three introduced species. Large numbers of eastern quolls (*Dasyurus viverrinus*), brushtail possums (*Trichosurus vulpecula*), Tasmanian pademelons (*Thylogale billardierii*) and Bennett's wallabies (*Macropus rufogriseus*) were recorded in a range of dry sclerophyll forests and pasture. Long-nosed potoroos (*Potorous tridactylus*) were recorded widely on the property in native vegetation with relatively thick ground cover. Given the level of survey effort and their potential to occur on the property it was remarkable that no Tasmanian bettongs (*Bettongia gaimardi*), eastern barred bandicoots (*Perameles gunnii*), southern brown bandicoots (*Isoodon obesulus*) or introduced house mice (*Mus musculus*) were recorded.

It rained heavily overnight and continued into the morning creating some concern about our planned activities for the day. Fortunately there were no major leaks in the tent community. At 7.30 am we welcomed Rodney Dillon from the Weetapotah Aboriginal Corporation who provided us with a welcome to country and spoke to us about Aboriginal issues, the aims of the Murrayfied management and how it is used to help Aboriginal people.

Thirty-eight field naturalists then headed off in a small convoy of cars to the southern end of the property near Variety Bay. George Rutherford and Sam Driessen opened the many gates, waited for the cars to pass, closed the gates and sprinted back to the lead car. Our first stop was the old ruins of St Peters Church that was erected in 1846 by pilot William Lawrence and builder K. Stewart. It was designed and later consecrated by Bishop Russell Nixon, the first Anglican Bishop of Tasmania. The remains exhibit rare colonial bond design brickwork with three brick width walls and ornate corbling around the roof line. The church was used from 1847 until the 1890s. The sky was overcast but no rain fell as field naturalists surveyed the ruins and surrounding bush. Large numbers of quoll, wallaby and pademelon scats were observed in the pastures. Scarlet robin (*Petroica boodang*), olive whistler (*Pachycephala olivacea*), blue wren (*Malurus cyaneus*), flame robin (*Petroica phoenicea*), fantail cuckoo (*Cacomantis flabelliformis*), grey shrike-thrush (*Colluricincla harmonica*), forest raven (*Corvus tasmanicus*) and spotted pardalote (*Pardalotus punctatus*) were seen and heard. Brown tree frogs (*Litoria ewingi*) were calling from a nearby pond. Portuguese millipedes (*Ommatoiulus moreleti*) were found among the ruins.

© Amanda Thomson

Gumboots and japaras – standard equipment for field naturalists in the Tasmanian bush!

Our next stop was the start of the Rookery Track; a short distance from the ruins of St Peters. While trying to find the start of the track, rain fell. But field naturalists are hardy if nothing else and with enthusiasm jumped from their cars and headed along the track. Our destination was a feature known as the Glue Plot. Armed with a map and GPS we were able to find the unmarked side track and headed towards the coast along a ridgeline on to what appeared to be a wallaby trail with occasional bits of flagging tape – some of the ribbons were the type used to wrap Christmas presents. The rain focused many of us on finding our destination rather than indulging ourselves with whatever might be about in the inclement weather. Nevertheless there were many plants that took our fancy such as: the creeping heathmyrtle (*Euryomyrtus parviflora*), which was common and in flower, the great sun-orchid (*Thelymitra aristata*), and the common fringemyrtle (*Calytrix tetragona*), which was also in flower – it is the only *Calytrix* in Tasmania.

We arrived at the Glue Pot at around 11.30 am. The Glue Pot is a sunken sea cave or doline. It is about 40 m in diameter with wet forest plants growing inside such as tasmanian blanketleaf (*Bedfordia salicina*) and musk daisybush (*Olearia argophylla*). Scattered around the edge of the hole were rocks with fossils – brachiopods that died in the Permian extinction, and bryozoans.

Fossil brachipods from the Glue Pot

A bedraggled green rosella (*Platycercus caledonicus*) watched us while perched in a drooping sheoak (*Allocasuarina verticillata*).

The broadleaf hopbush (*Dodonaea viscosa*) was looking lovely with its reddish pink seeds.

Dodonaea viscosa, *spectacularly showing off its maturing pink-red fruit*

Robyn Gates found the cocoon of a helena gum moth (*Opodiphthera helena*). This is Tasmania's largest moth (wingspan 17 cm) and they can take from a few weeks to two years to emerge from their cocoon. The cocoon looked like wallaby dung. A couple of snails were found, the large forest snail (*Caryodes dufresnii*) and *Bothriembryon tasmanicus*.

Bothriembryon tasmanicus (Tasmanian tree snail), *an air-breathing terrestrial snail usually found on trees and shrubs close to the sea*

We also found the forest germander (*Teucrium corymbosum*) among the open sheoak litter on a bank sloping to the sea. This species is listed as rare on the Tasmanian *Threatened Species Protection Act 1995*. It has only been found one other

time on Bruny Island (1986, also from Variety Bay): these records represent the southernmost extent of the species in Australia. Most field naturalists ate their lunch here during a break in the rain but others had left their lunch back at the car and had returned.

A native wasp takes shelter in grass: protected from predators but not cameras!

We all returned to our cars and drove a short distance to the ruins of the old pilot station. It was cold, overcast and windy, but the rain had stopped. The ruins showed the same brick construction that we observed at the church ruins. There were impressive views of Storm Bay from where the house once stood, although now obscured by some large shrubs including one massive tasmanian blanketleaf. We walked down the grassy slopes to a rocky beach. On the way down to the beach, several field naturalists were lucky enough to encounter an echidna (*Tachyglossus aculeatus*), which proceeded to bury itself beneath the overhanging leaves of a sagg (*Lomandra longiflora*). The rocky beach was full of stones with lots of fossils and the field naturalists spent a pleasurable hour exploring.

After returning to the cars, the weather had improved a little and we decided to go to the nearby airport where Don Hird had established 50 nest boxes for pygmy possums (*Cercatetus* spp.). The nest boxes were strapped to trees within the scrub adjacent to the airstrip. The children had great fun trying to find each nest box in the scrub. The boxes were carefully opened to check if they were occupied. Many of the nest boxes contained nesting material; either balls of moss, shredded bark or twigs of *Banksia* and *Melaleuca*. One of the early nest boxes was filled with twigs and clearly contained an animal – a black rat (*Rattus rattus*). While inspecting the nest it decided to bolt and leaped from the trap into mid-air and narrowly missed landing on Henry Rutherford's nose. We systematically checked the traps and found some contained large black spiders, ants, one had two raspy crickets (*Kinemania* sp.). With five traps to go we were beginning to despair of finding a pygmy possum and some field naturalists had decided to return to camp, alas for them the fourth last trap contained a mother little pygmy possum (*Cercartetus nanus*) and her two young.

We returned to base just after 5 pm and prepared a feast of salads, 30 steaks, 50 sausages and platters of fruit. James Wood had all the children captivated with a dice game called zilch. After dinner, around 8 pm, a number of field naturalists drove down to the neck to see the shearwaters (*Puffinus tenuirostris*) and penguins (*Eudyptula minor*). On the drive down we saw many quolls, brushtail possums, Tasmanian pademelons and Bennett's wallabies, and one rabbit. On arrival we were rewarded with shearwaters gliding overhead looking for burrows. Many were already on the ground scurrying around, sitting or squabbling. Some appeared to be pairing up. We thought we had missed the penguins but after about ten minutes of waiting we saw groups of 10-20 penguins leave the surf and scurry nervously up the beach and into the dune vegetation where they followed well-worn paths. It was brisk in the strong winds coming off the crashing surf. Amanda Thomson, who went to the lookout overlooking the beach, was

excited to see luminous waves caused by phosphorescent algae in the breaking water. The drive back to the base saw no lessening in the number of quolls, possums and wallabies observed along the road.

Sunday morning the shearer's quarters was bustling with activity. Field naturalists were eating their breakfasts, preparing their lunches and cleaning up in preparation of leaving. We drove to a small reserve on the property that had been fenced off from sheep grazing. It contained a stand of the southernmost population of the southern grasstree (*Xanthorrhoea australis*). Before entering the reserve all boots were washed and sprayed with methylated spirits to avoid transporting root rot into the stand. The weather had improved substantially, it was overcast but mild, and we spent the next hour and a half exploring the small reserve. We saw or heard striated pardalotes (*Pardalotus striatus*), pallid cuckoos (*Cacomantis pallidus*), grey shrike-thrushes, olive whistlers, fan-tailed cuckoos and tree martins. Plants in flower included: golden pea (*Aotus ericoides*), drooping sheoak (*Allocasuarina verticillata*), running postman (*Kennedia prostrata*), waxlip orchid (*Glossodia major*), tiger orchid (*Diuris sulphurea*), curling everlasting (*Corondium scorpioides*) and dwarf sundew (*Drosera pygmaea*), which were all duly photographed. We would have liked to spend more time here but many needed to travel home in the afternoon and the official activities were completed around 12 noon. Some field naturalists decided to explore more of the northern part of the island rather than take the 12.30 pm ferry back to the mainland.

The population of Xanthorrhoea australis *is geographically significant in Tasmania*

It was a terrific weekend, enjoyed by all despite some challenging weather. On behalf of all the field naturalists who attended, I thank the Indigenous Land Corporation and Wectapotah Aboriginal Corporation for allowing us to stay on Murrayfield, in particular our hosts Bruce & Lynne Michaels who welcomed us to the property, and Rodney Dillon who came over on Saturday morning to provide a welcome to country. I also thank the field naturalists who contributed their observations to this article.

Is there a collective noun for a group of field naturalists?

EVIDENCE FOR A THIRD SPECIES OF *GASTRODIA* (POTATO-ORCHID) IN TASMANIA

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INTRODUCTION

The genus *Gastrodia* is represented by about 35 species, 7 endemic in Australia, the others distributed through India, Indonesia, Malaysia, New Guinea and New Zealand (Jones 2006). The plants have a rootless fleshy rhizome that sometimes looks like a potato (hence the vernacular name) and a leafless fleshy to wiry brown flower stem (Jones 2006).

For many years, Tasmania had just the one species of *Gastrodia*, then referred to as *Gastrodia sesamoides* (e.g. Firth 1965; Curtis 1975; Jones et al. 1999; Jones 2006). However, it was widely recognised by orchidologists and field botanists that there were two entities, quite distinct from one another: a shortly-statured light cinnamon brown taxon with the flower spike in a distinct shepherd's crook shape (i.e. nodding) when in bud; and a much taller robust taxon with dark brown to almost black stems and erect flower spikes when in bud. The robust entity (*Gastrodia procera*) was partially described by Carr (1991) and more formally circumscribed by Jones (1998) in a review of all Tasmanian orchid genera.

Jones (2008) described a new species of *Gastrodia*, *G. surcula*, apparently restricted to higher elevations in the Australian Capital Territory and southern New South Wales (Jones et al. 2008).

The distinguishing character of this new entity is that it forms localised clonal groups with the flowering stems connected in a network of irregular subterranean rhizomes (Jones et al. 2008). The inflorescence also generally has fewer and less crowded flowers, the flowers with a labellum midlobe that is ovate-oblong (Jones 2008).

This article presents evidence for the presence of *G. surcula* in Tasmania, based on four collections, anecdotal reports and digital images.

EVIDENCE FOR A THIRD SPECIES

Tahune 2008

On 29 December 2008 H. & A. Wapstra noticed a colony of *Gastrodia* about halfway up the walking track to the Tahune Air Walk in bare ground in a bend of the track. There were at least 15 plants in an area of about 1 x 1.5 m. They were pale, thin-stemmed, about 25 cm tall, still in bud with the nodding inflorescence typical of *G. sesamoides*. We were puzzled to find them in the deep shade of a wet sclerophyll/mixed forest (as compared to dry sandy heathland or woodland, the more typical habitat for this species). Other things that stood out were the large number in such a small patch and the lateness in the season (about a month later than those we were familiar with). For various reasons, no samples or images were taken that day.

King Island

In October 2009 H. & A. Wapstra visited Eva & Martin Finzel on King Island, Bass Strait, who showed us photographs of a dense stand of numerous of what we presumed were *G. sesamoides* from their

property. These strongly reminded us of the Tahune encounter. The plants had not yet emerged at the time and we asked that they collect some samples later in the year, including underground parts to establish if the individual plants were connected, as by this time we were aware that Jones had described a new clonal species, *G. surcula* (Jones 2008).

At the King Island site the plants occur in tall scrub dominated by *Leptospermum scoparium*, *Monotoca glauca* and *Banksia marginata*. A striking feature of the population was the density of flowering scapes (Plates 1 & 2), which is quite atypical of *Gastrodia sesamoides* – one patch supported about 50 stems in 30 x 50 cm, and another patch 10 stems in 15 x 15 cm. The Finzels supplied numerous images and several excavated plants. Another striking feature was that the plants were not growing as individuals from a single tuber but arising from tubers joined by narrow rhizomes (Plates 3 & 4). Of note is the stature of the plants (Plates 1 & 2): certainly not as tall as typical *G. procera* but taller than most *G. sesamoides*). The colour of the scape is also of interest (less dark than typical *G. procera* but darker than most *G. sesamoides*). The inflorescence in bud is quite typical of *G. sesamoides* (i.e. hooked – Plate 1) but more typical of *G. procera* at full anthesis (i.e. erect with individual flowers more spread out along the scape – Plate 2).

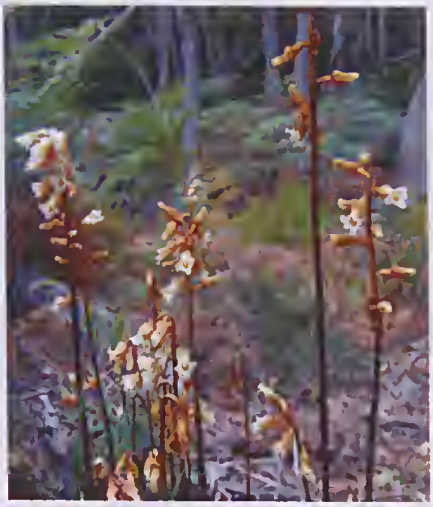

Plate 1 (above). A mass of closely growing stems of *Gastrodia* plants on King Island – note especially the pale brown colour of scapes and the nodding inflorescences in bud

Plate 2 (above right). Later stage flowering of the King Island plants showing the more erect flower spike with more widely separated flowers

Plate 3 (left). Whole plant showing two scapes arising from separate fleshy rhizomes connected to a larger fleshier tuber. **Plate 4 (right).** Close-up of the same tuber-rhizome system

Tahune 2009

On 22 December 2009 H. & A. Wapstra revisited the Tahune site to make a collection but found that the 2008 colony had entirely disappeared. However, we found a few similar plants, mostly as singles but one pair in leaf litter emerging about 5 cm apart. When we dug these up, their tubers were connected with a fleshy brittle rhizome (Plates 5 & 6). We also exposed the tuber of another plant and followed the rhizome for about 1 m in the direction of another specimen. This effort demonstrated that these plants were also connected by a rhizome, but we covered it up without taking a specimen.

This patch occurs in tall wet sclerophyll/mixed rainforest, so quite different habitat to that on King Island.

Plate 5. Context of the pair of *Gastrodia* at Tahune (circled) with another individual in the background (circled)

Plate 6. Excavated pair of flowering scapes from the Tahune site shown in Plate 5

Longley

In December 2009, Malcolm Wells and Peter Fehrc (UpClosc Tasmania orchid photographers) made mention of a close-growing patch of tall *Gastrodia* at Huon Road, Longley (Plate 7). These plants were growing in leaf litter under a mature *Acacia dealbata* (silver wattle). Malcolm and Peter subsequently (1 January 2010) made an excavation of two flowering scapes and the associated tubers, which were connected.

Plate 7 (left). A mass of closely growing stems of *Gastrodia* plants in leaf litter under a strip of mature silver wattles near Longley

Of note is that at about the same time, and on the same property, Malcolm and Peter also encountered a patch of what we are quite comfortable calling *G. procera*, based on stature and colour. Unlike typical *G. procera*, however, these were growing as a dense patch, amongst a pile of mulch (Plate 8). A possible explanation of this population is that the mulching process cut up numerous tubers and several individuals arose from these tuber pieces – *Gastrodia procera* occasionally turns up in mulched garden beds.

Plate 8. Dense patch of *Gastrodia procera* in a pile of mulch near Longley

South Hobart

In December 2010, Mark Wapstra encountered a relatively dense patch of quite tall *Gastrodia* in South Hobart. I assessed the site as part of a development proposal to install a new water pipeline so the patch was going to be excavated by a massive machine anyway, and I took the opportunity to remove some plants prior to works being undertaken. At first I thought these were simply *G. procera*, because of their stature, generally erect flower spike (although in bud several were hooked) and dark colour to the scape (Plates 9 & 10) but on excavation it became clear that the expected single tuber was in fact a mass of interconnected rhizomes and tubers, with flowering scapes arising from several locations along the same rhizome (Plate 11). In addition, the stature did not reach the sometimes massive height of *G. procera* and the scape was not as dark as most specimens.

Plate 9 (left). Dense patch of *Gastrodia* at South Hobart – note the stature, erect flower spikes and dark brown-black stems

Plate 10 (right). Another part of the same patch, with several plants at an earlier stage of flowering – it is difficult to discern in the image but many of the flower spikes are nodding in bud

I washed the clump of scapes (Plate 12) carefully with a hose, loosening dirt with a pair of forceps, eventually ending up with a dirt-free tangled mass of rhizomes and tubers (Plate 13). Tubers were connected by quite narrow diameter rhizomes, which were quite brittle and broke easily (Plate 14). While the mass did not resemble the more delicately connected and more separated tubers of the King Island collections, the overall impression is of similar plants. The difference in the density of the rhizome-tuber system may be a function of soil friability.

WHERE TO FROM HERE?

The protologue of *Gastrodia surcula* is quite brief (Jones 2008) and is presumably based on limited material, especially with respect to examination of the rhizome and tuber system of flowering specimens. The problem is that when field botanists record *Gastrodia*, we don't dig them up to look at the form of the rhizome: we never had to – they were either small, light brown and nodding in flower (*G. sesamoides*) or tall, dark brown-black and erect in flower (*G. procera*). This means that it is virtually impossible to know how many, if any, of our records of *Gastrodia* in Tasmania may refer to the suspected new entity (and whether this should be called *Gastrodia surcula*). However, we have asked several botanists of their memory of how individuals of *Gastrodia* grow in Tasmania and it appears that the majority grow as singles or dispersed patches but not dense patches, the latter probably indicative of

Plate 11. *In-situ* excavation of some of the flowering stems – note the branching rhizomes narrowly connected to larger fleshy tubers and two scapes arising from the same tuber-rhizome mass

Plate 12 (left). The excavated clump of flowering stems before hosing

Plate 13 (right inset). The end result of removing most of the dirt

Plate 14. Partially cleaned mass of tubers and rhizomes – note the multiple flowering scapes arising from the same mass, the delicately connected rhizomed and the numerous small "buds" on the main fleshy tubers

the interconnected rhizome characteristic. Jones et al. (2008) noted that *G. surcula* is difficult to separate from *G. sesamoides*, which is mainly found at lower elevations and grows as single plants or in dense clusters with the rhizomes separate.

Jones (2008) and Jones et al. (2008) described the habitat of *Gastrodia surcula* in the Australian Capital Territory and southern New South Wales as "higher montane and subalpine areas" in "snowgum woodland, often on road embankments and beside tracks in well-drained loam" at elevations of 1000–1200 m. They applied the vernacular name of "snowgum potato-orchid" but perhaps "cloning potato-orchid" would better describe our specimens. None of the locations suspected of supporting *Gastrodia surcula* in Tasmania could be described as "montane" or "snowgum woodland": all are below 500 m elevation and from the dry to wet sclerophyll (eucalypt) forest. Whether *Gastrodia surcula* turns out to be more widespread and occurs in a broader range of habitats and elevations on mainland Australia is yet to be seen but it is quite conceivable that the more southerly latitudes of Tasmania mean that the species occurs at lower elevations and in drier (but colder) habitats (this is certainly the case for many other Tasmanian populations of vascular species we share with montane mainland Australia).

For the moment, pending a more detailed morphometric-genetic study, which would be necessary to confidently assign the suspected collections of *G. surcula* to that species, or indeed another, we have chosen to lodge the material (at the Tasmanian Herbarium) from all sites as *G. surcula*.

The collections comprise pressed plants, spirit collections and images along with the associated rhizomes and tubers. We now urge field workers that encounter *Gastrodia* to make an effort to ascertain the nature of the rhizome-tuber system and make collections, along with notes on the density of flowering scapes. Although they make unwieldy specimens on an herbarium sheet, including the tuber and rhizome is vital to making an accurate identification.

The authors would welcome viewing images and/or collected material of *Gastrodia* from anywhere in Tasmania, and are happy to submit such material to the Tasmanian Herbarium on behalf of the original collector, along with details of the collection site and population.

ACKNOWLEDGEMENTS

Thanks to Eva & Martin Finzel, and Malcolm Wells and Peter Fehre, for supplying plant material and use of images from King Island and Longley, respectively.

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NOTES ON AVIAN SPECIES RECORDED ON MARIA ISLAND DURING THE 2011–2012 SEASON OF *THE MARIA ISLAND WALK*

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INTRODUCTION

Guides for *The Maria Island Walk* have been recording bird observations on the island since 2005 and the data is forming an excellent record for comparison into the future. As Maria Island is a refuge and home to a wide variety of birds, it will be interesting to see how they are affected by the proposed introduction of the Tasmanian Devil to the island, which may occur as early as November 2012.

OBSERVATIONS

Following the article is a full list of species reported during the 2011–2012 season, listed in the taxonomic order of Christidis & Boles (2008). A future article will provide a cumulative list of all species reported to date during the course of *The Maria Island Walk* (see also Wakefield & Wakefield (2011) and Wakefield & Hayward (2010) for previous reports).

The species recorded during the 2011–2012 season were much the same as in previous years. The Little Wattlebird is again noticeable for its absence. The Willie Wagtail is a doubtful sighting as there was no photographic evidence. This species can be easily confused with a Grey Fantail by people from mainland Australia who may assume that the Willie Wagtail also occurs in Tasmania, although it has been sighted in Tasmania from time to time so there is a possibility that the observer was correct.

SYSTEMATIC LIST

PHASIANIDAE (pheasant family)	
Caturnix ypsilaphara	Brown Quail
ANATIDAE (duck family)	
Anas castanea	Chestnut Teal
Anas superciliasa	Pacific Black Duck
	Feral (hybrid) Duck
Biziura labata	Musk Duck
Cereapsis navaehallandiae	Cape Barren Goose
Cygnus atratus	Black Swan (cygnet)
Chenanetta jubata	Australian Wood Duck
PODICIPEDIDAE (grebe family)	
Paliocephalus poliacephalus	Hoary-headed Grebe
COLUMBIDAE (pigeon family)	
Phaps elegans	Brush Bronzewing
DIOMEDEIDAE (albatross family)	
Thalassarche cauta	Shy Albatross
Thalassarche melanaphris	Black-browed Albatross

ACKNOWLEDGEMENTS

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PROCELLARIIDAE (petrel family)
- *Macronectes giganteus* Southern Giant-petrel
- *Pelecanoides urinatrix* Common Diving-petrel
- *Puffinus tenuirastris* Short-tailed Shearwater

SPHENISCIDAE (penguin family)
- *Eudyptula minor* Little Penguin

SULIDAE (booby family)
- *Morus serrator* Australasian Gannet

PHALACROCORACIDAE (comorant family)
- *Microcarba melanoleucos* Little Pied Cormorant
- *Phalacrocorax carbo* Great Cormorant
- *Phalacrocorax fuscescens* Black-faced Cormorant
- *Phalacrocorax sulcirostris* Little Black Cormorant

PELECANIDAE (pelican family)
- *Pelecanus conspicillatus* Australian Pelican

ARDEIDAE (heron family)
- *Egretta novaehollandiae* White-faced Heron

ACCIPITRIDAE (hawk family)
- *Aquila audax fleayi* Wedge-tailed Eagle
- *Circus approximans* Swamp Harrier
- *Haliaeetus leucogaster* White-breasted Sea-eagle

RALLIDAE (rail family)
- *Tribonyx mortierii* Tasmanian Native Hen

HAEMATOPODIDAE (oystereatchers)
- *Haematopus fuliginosus* Sooty Oystereatcher
- *Haematopus langirostris* Pied Oystereatcher

CHARADRIIDAE (plover family)
- *Charadrius bicinctus* Double-banded Plover
- *Charadrius ruficapillus* Red-capped Plover
- *Thinornis rubricallis* Hooded Plover
- *Vanellus miles* Masked Lapwing

SCOLOPACIDAE (sandpiper family)
- *Calidris ruficollis* Red-necked Stint

LARIDAE (gull family)
- *Chroicocephalus novaehollandiae* Silver Gull
- *Hydroprogne caspia* Caspian Tern
- *Larus dominicanus* Kelp Gull
- *Larus pacificus* Pacific Gull
- *Thalasseus bergii* Crested Tern

CACATUIDAE (cockatoo family)
- *Calyptorynchus funereus* Yellow-tailed Black Cockatoo

PSITTACIDAE (parrot family)
- *Lathamus discolor* Swift Parrot
- *Platycercus caledonicus* Green Rosella

CUCULIDAE (cuckoo family)
- *Cacomantis flabelliformis* Fan-tailed Cuckoo
- *Cacomantis pallidus* Pallid Cuckoo
- *Chalcites basalis* Horsfields Bronze-cuckoo

STRIGIDAE (boobook family)
- *Ninox novaehollandiae* Southern Boobook

HALCYONIDAE (kookaburra family)
- *Dacelo novaeguineae* Laughing Kookaburra

ACANTHIZIDAE (thornbill family)
- *Acanthiza chrysorrhoa* Yellow-rumped Thornbill
- *Acanthiza ewingii* Tasmanian Thornbill

PARDALOTIDAE (pardalote family)
- *Pardalotus punctatus* Spotted Pardalote
- *Pardalotus quadragintus* Forty-spotted Pardalote
- *Pardalotus striatus* Striated Pardalote

MELIPHAGIDAE (honeyeater family)
- *Acanthorhynchus tenuirostris* Eastern Spinebill
- *Anthochaera paradoxa* Yellow Wattlebird
- *Epthianura albifrans* White-fronted Chat
- *Lichenostomus flavicollis* Yellow-throated Honeyeater
- *Melithreptus affinis* Black-headed Honeyeater
- *Melithreptus validirostris* Strong-billed Honeyeater
- *Phylidonyris novaehallandiae* New Holland Honeyeater
- *Phylidonyris pyrrhopterus* Crescent Honeyeater

PSOPHODIDAE (quail-thrush family)
- *Cinclosoma punctatum* Spotted Quail-thrush

CAMPEPHAGIDAE (cuckoo-shrike family)
- *Coracina novaehollandiae* Black-faced Cuckoo-shrike

PACHYCEPHALIDAE (whistler family)
- *Colluricincla harmonica* Grey Shrike-thrush
- *Melanodryas vittata* Dusky Robin
- *Pachycephala olivacea* Olive Whistler
- *Pachycephala pectoralis* Golden Whistler

ARTAMIDAE (woodswallow family)
- *Artamus cyanopterus* Dusky Woodswallow
- *Gymnorhina tibicen* Australian Magpie
- *Strepera fuliginosa* Black Currawong
- *Strepera versicolor* Grey Currawong

RHIPIDURIDAE (fantail family)
- *Rhipidura albiscapa* Grey Fantail

CORVIDAE (crow family)
- *Corvus tasmanicus* Forest Raven

PETROICIDAE (robin family)
- *Petroica boodang* Scarlet Robin
- *Petraica phoenicea* Flame Robin

ALAUDIDAE (skylark family)
- *Alauda arvensis* Skylark

TIMALIIDAE (white-eye family)
- *Zosterops lateralis* Silvereye

HIRUNDINIDAE (swallow family)
- *Hirundo neoxena* Welcome Swallow
- *Petrochelidon nigricans* Tree Martin

STURNIDAE (starling family)
- *Sturnus vulgaris* European Starling

ELSTRILDIDAE (finch family)
- *Stagonopleura bella* Beautiful Firetail

PASSERIDAE (sparrow family)
- *Passer domesticus* House Sparrow

MOTACILLIDAE (pipit family)
- *Anthus novaeseelandiae* Australasian Pipit

FRINGILLIDAE (introduced finches)
- *Carduelis carduelis* European Goldfinch

SOME OBSERVATIONS ON THE BEHAVIOUR OF THE MOSS FROGLET *BRYOBATRACHUS NIMBUS*

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INTRODUCTION

The moss froglet *Bryobatrachus nimbus* (Rounsevell, Ziegeler, Brown, Davies & Littlejohn 1994) is a small fossorial frog with a restricted distribution to south-west Tasmania. Within its range this species shows altitudinal variation where in the east of its range it occurs above 800 m elevation and in the west it can be found close to sea level. The frogs have been recorded from subalpine moorlands as well as poorly draining rainforest.

Observations were made of calling behaviour and the nature of the egg mass in January 2011 in the Hartz Mountains National Park southwest of Hobart, Tasmania. Observations were made over two days with periods of intense rainfall and strong wind gusts. There was consistent rainfall throughout the two days and temperature fluctuated between 14–17°C.

TAXONOMY

The taxonomic status of the moss froglet is contentious. The genus *Crinia* was first proposed by Tschudi (1838) for the type species *Crinia georgiana*. Later the genus *Ranidella* was created to accommodate *Crinia signifera* and its related species. However, it was later synonymised with *Crinia* (Read et al. 2001). This complicated taxonomic history reflects the variability in the size, shape and call of the frogs currently in the genus *Crinia* (Barker et al. 1995).

Upon its discovery in 1994 the moss froglet (Plate 1) was placed in the new genus *Bryobatrachus*. In their initial description, Rounsevell et al. (1994) identified key osteological characteristics such as the presence of teeth on the maxillary arch, reduced palatines, presence of a columella in conjunction with the fusion of lower vertebral column with the sacrum. These morphological features as well as its unique biology were not shared with any existing species or genera at the time.

A study of phylogenetic relationships between frogs in the genus *Crinia* and related taxa revealed that there was a distinct clade comprising *Crinia tasmaniensis* and *Bryobatrachus nimbus* (Read et al. 2001). The results of these preliminary genetic sampling led to *Bryobatrachus* being synonymised with *Crinia*.

Plate 1. An adult moss froglet (*Bryobatrachus nimbus*), Hartz Mountains National Park, Tasmania

The moss froglet possesses many unique morphological features as well as its unique life history in the form of terrestrial egg deposition and lacking a free-swimming tadpole stage. This author believes that the aforementioned features in combination with its distinct call indicate that this species is significantly different to other members in the genus *Crinia* to warrant the reinstatement of the genus *Bryobatrachus*.

CALLING BEHAVIOUR

The call of the moss froglet is a soft tapping noise repeated at intervals. At Hartz Mountain over two days the frogs called from 10:00 am AEDST through to 17:00 pm AEDST. This is due to the constant rainfall and damp conditions, which was identified as being suitable conditions for calling by Rounsevell et al. (1994). There was a noticeable decrease in activity in the middle of the day when the temperatures were at their highest. The intensity and number of the frogs increased later in the day as the light faded and ambient temperature decreased.

The calling frogs seemed to be easily disturbed. When calling frogs were approached they would become silent and stop calling for extended periods. It is possible that the frogs were sensing movement through small tremors in the earth. A male frog was located calling above the ground atop a clump of moss but concealed beneath a dense shrub. This behaviour is different to other frogs that call during the day such as *Pseudophryne* and *Geocrinia* that are well concealed and call from beneath debris and vegetation, or in cavities in the case of *Philoria* species (Knowles et al. 2004). By calling above the substrate but still under the cover of the low shrubs that occur at Hartz Mountain, the moss froglet would be quite sensitive to disturbance.

BREEDING

One nest was observed partially buried in a cavity amongst the moss. The nest cavity was within the vegetation matrix as described by Mitchell (2002a). The cavity varied in depth from 5–15 mm and was located beneath low growing prostrate shrubs in subalpine moorland. The nest was within 20 cm of slowly flowing water and still pools. The shallow nature of the nest and its size seems to be consistent for this species (Mitchell 2002a, 2002b). Interestingly, the nest appeared to be unattended.

In comparison to other genera, which have terrestrial egg masses such as *Philoria* and *Pseudophryne*, it is unusual to find the eggs unattended (pers. obs). Rounsevell et al. (1994) described finding single frogs, pairs or unattended eggs in the nests that were located. It may be a feature of this species that the adult frogs do not maintain obligate parental care of the eggs for an extended period.

There were eight eggs within the nest (Plate 2), which again seems consistent for this species (Mitchell & Seymour 2003; Anstis 2002; Rounsevell et al. 1994). The egg capsules were large and fluid each containing a single embryo. The individual capsules were sticky and adhered to neighbouring eggs to form a combined mass.

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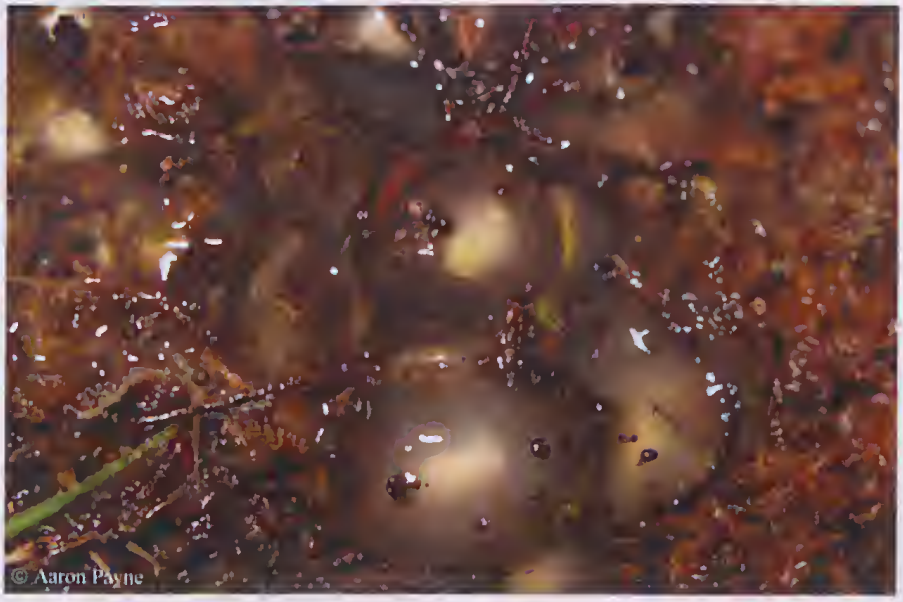

Plate 2. Egg mass of the moss froglet, from Hartz Mountains National Park, Tasmania

ARE BIRDS IMPORTANT PREDATORS OF LEAF BEETLES IN TASMANIAN EUCALYPT PLANTATIONS?

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ABSTRACT

Chrysomelid leaf beetles are chronic defoliators of eucalypt plantations in Australia, often requiring active management that includes insecticide spraying to prevent economically significant loss of growth. To investigate the possible role of birds as predators of eucalypt leaf beetles in *Eucalyptus* plantations, six *E. nitens* plantations distributed around Tasmania were surveyed monthly for presence of birds during five summer to autumn months, based on calls and sightings. Concurrently, populations of eucalypt leaf beetles were sampled in the same plantations. The relationship between birds and beetles was explored.

Nineteen bird species, excluding unidentified little brown birds, were identified in the six eucalypt plantations throughout the survey period. All except one species are classified as including insects in their diet. Seven species were endemic to Tasmania and only the Laughing Kookaburra was introduced. The numbers and frequencies of bird species varied three-fold among sites but there was little monthly variation. By contrast, the leaf beetle populations (*Parospsisterna* spp.) varied six-fold among sites and showed very large monthly variations. However, there was no detectable correlation between frequency of bird species recorded and leaf beetle populations by site or by month. Frequency of bird species was highest at sites with the most dense understorey and grazing land bordering plantations.

This study showed that *E. nitens* plantations support regular populations of insectivorous birds but the data suggested that birds are probably only opportunistic predators of leaf beetles and not important for the management of leaf beetle populations in eucalypt plantations.

INTRODUCTION

There have been relatively few studies on birds occuring in *Eucalyptus* plantations. Birds are present but numbers are generally lower than in surrounding native forest in southern Western Australia (Hobbs et al. 2003; Matsuki 2005 & unpubl. data), as well as in Brazil, where eucalypts are not native (Marsden et al. 2001). Plantations in Victoria were favoured by insectivorous birds compared to agricultural land use, particularly woodland-dependant birds that forage in the canopy and tall shrubs or on the ground between trees (Kavanagh et al. 2007; Loyn et al. 2007).

Leaf beetle larvae and adults (Plates 1 & 2) form a significant proportion of the insect population in the canopy of plantation eucalypts during the summer and autumn months, from mid-November to March (Elek et al. 2004; Loch 2005). In Tasmania, the most prevalent eucalypt leaf beetle species in *E. nitens* plantations over two years old are the Tasmanina leaf beetle, *Paropsisterna* (formerly *Chrysophtharta*: Reid et al. 2006) *bimaculata* (Olivier), Southern leaf beetle,

P. agricola (Chapuis) and the newly described leaf beetle, *P. selmani* de Little & Reid (formerly grouped with *P. gloriosa*: de Little & Reid, unpubl. MS) (de Little 1983; Nahrung 2004). Adult beetles of all three species prefer to feed on the flush adult-phase foliage in the upper crown. Both *P. bimaculata* and *P. selmani* lay their eggs so that their larvae develop on the same adult flush foliage, whereas *P. agricola* lays its eggs so that its larvae develop on the flush, glaucous juvenile-phase foliage on young trees (de Little 1983; Lawrence et al. 2003; Nahrung 2004; de Little & Reid unpubl. MS).

Leaf beetles can cause significant defoliation of eucalypt plantations in Australia, often requiring insecticidal spraying to protect the plantations from economically significant loss of growth (Elliott et al. 1992; Elek 1997).

A comprehensive review of alternative methods for managing eucalypt leaf beetles has summarised the existing knowledge on natural enemies of leaf beetles (Elek & Wardlaw in press). Most natural enemies documented are predaceous or parasitic insects (e.g. Elliott & de Little 1980; Bashford, 1999; Rice, 2005; Nahrung et al. 2008). The only evidence of bird predation on eucalypt leaf beetles is unpublished observations in Tasmanian (C. Spencer & K. Richards, pers. comm. 2009).

The aim of this study was to investigate whether birds could be important predators and assist in managing potentially damaging populations of chrysomelid leaf beetles in eucalypt plantations. This paper documents the bird species present in *E. nitens* plantations and explores the relationships between these and leaf beetle populations in eucalypt plantations around Tasmania throughout one season.

METHODS

Monitoring sites

Six plantations of *Eucalyptus nitens* that had suffered significant defoliation by leaf beetles during the previous summer were selected for monitoring. The plantations were all first-rotation following clearing of wet sclerophyll mixed eucalypt forest. They provided a balance of sites in the north and south of Tasmania and ranged in altitude from 200 m to over 700 m above sea level (Table 1). All plantations had windrows approximately every 10 rows (or 44 m) consisting of partially burnt logs that supported dense undergrowth. The land use bordering the plantations was noted and the understorey species along eight transects (see below) at each site were recorded and their relative density classified into three categories: sparse (less than one third of the ground covered), medium (one third to two thirds of the ground covered - patchy) or dense (more than two thirds of the ground covered). Each plantation was four or five years old and 6–11 m tall (planted in 2006 or 2007), and the majority of trees were changing from juvenile to adult-phase foliage. At each plantation site, two 40 x 40 m plots were marked out, at least 225 m apart at their edges. From the edges of each plot, 4 x 100 m transects were set up running out in the four cardinal directions.

Monitoring presence of birds

Birds were monitored monthly, from December 2010 to April 2011, along each of the four transects associated with each *E. nitens* plot. Some monitoring periods were missed at two sites, Repulse and Moina, after these had been aerially sprayed with insecticide, and during some months, when the weather was very windy or rainy, only two of the four plot transects were monitored. Monitoring was carried out generally between about 1000h to

Plate 1. Adult *Paropsisterna selmani* on the leaf of a eucalypt

Plate 2. Larvae of *Paropsisterna* on the leaf of a eucalypt

Table 1. Site details of six *E. nitens* plantation sites around Tasmania where birds and leaf beetles were monitored during summer 2010–2011 (NF = native forest)

Site	Coupe name	Altitude (m)	Area (ha)	Planted	Land use on boundaries	Understorey density	Vegetation dominants	Other species
Crayfish (north)	CF056A	206	22	Sep-06	NF & plantation	Sparse	*Pomaderris apetala* *Pteridium esculentum*	*Senecio linearifolius*
Castra (north)	CA120A	423	25	Sep-06	NF & pasture	Dense	*Pomaderris apetala* *Nematolepis squamea*	*Zieria arborescens* *Pteridium esculentum* *Dicksonia antarctica*
Moina (north)	MI014C	622	28	Oct-06	NF & pasture	Medium	*Acacia dealbata* *Rubus fruticosus* agg.	*Pteridium esculentum* *Acaena novae- zelandiae*
Franklin (south)	FN004E	537	30	Nov-06	NF & young regen.	Medium	*Gahnia grandis* *Acacia dealbata*	*Pomaderris apetala* *Acacia verticillato* *Prostanthero lasianthos* *Nematolepis squamea*
Repulse (south)	RP021Z	631	26	Sep-06	NF & plantation	Dense	*Pteridium esculentum* *Acaena novae-zelandiae*	*Acacia dealbata* *Dicksonia antarctica*
Wentworth (south)	WW022D	712	22	Oct-07	NF	Sparse	*Olearia lirata* *Bedfordia linearis*	*Hakea lissosperma* *Dianella tasmanica* *Gastrodia sesamoides* ferns

1600h, spending about 30 min. on each transect. Bird species were recorded as present at each plot on each monitoring occasion, when sighted with binoculars or heard calling within the plot (Watts 1999; Simpson & Day 2010). Birds flying overhead were not recorded. Small brown birds that could not be unidentified were combined into one category of 'unidentified little brown birds' (lbbs), which may have included some of the small species that were recorded separately, as well as other unidentified lbbs.

The bird records were summarised as total numbers of species recorded, and total numbers of monitoring occasions that each species was present at each site as a proportion of the total number of monitoring sites and occasions (maximum 60). These two indices were tabulated by site characteristics (altitude, latitude and understorey, see Table 1) and related to leaf beetle populations.

Sampling leaf beetle populations

Beetle populations were estimated in two ways. Firstly, static yellow sticky traps at each site that continuously trapped adult beetles flying on the transects; secondly, egg, larval and adult beetles on the *E. nitens* foliage along the transects were monitored using binoculars monthly, at the same time that the birds were surveyed.

The static sticky traps were made of bright yellow 'corflute', 30 x 40 cm. They were attached vertically to poles about 5 m high. One vertical half of each side was coated with 'stickum' (15 x 40 cm) while the other half was left uncoated to provide constant attraction. The stickum was replaced if it was covered with too many insects that might have compromised its attraction or trapping ability. Four traps were set up in one plot at each site, 50 m along the transects. They were set up in October, and sampling commencing mid-November.

All the adult leaf beetles that were caught on the traps were identified, counted and removed approximately fortnightly during November, January and February, but monthly during December, March and April. The counts from both sides were combined, and all counts were adjusted to mean number of beetles per fortnight for ease of comparison. Some sampling periods were missed at two sites, Repulse and Moina, after these had been aerially sprayed with insecticide.

The binocular monitoring for leaf beetle populations was carried out on five *E. nitens* trees at the four edges of each plot and again on five trees 50 m outside each plot along the transects near the sticky traps. Four branches of adult foliage on one side of each tree were scanned using binoculars and the numbers of leaves occupied by eggs, larvae or adults were recorded per tree (40 trees per plot, 80 per site). Leaf beetle species could not be identified reliably with binoculars.

Relationships between birds present and leaf beetle populations

The relationships between birds and leaf beetles were explored using scattergrams with estimates of leaf beetle populations: the mean sticky trap populations per site averaged over the five months of sampling, and the leaf beetle populations assessed on the *E. nitens* trees with binoculars in each plot each month.

RESULTS

Presence of birds

Nineteen bird species were identified in the six eucalypt plantations throughout the summer, not including the unidentified little brown birds (lbbs) which probably included several more species (Figure 1). Yellow-throated Honeyeater was the most

frequently recorded bird species present in all the plantations throughout the sampling period, recorded twice as frequently as the next most common bird, Grey Shrike-thrush, which in turn was twice as frequent as Grey Fantail, Yellow Wattlebird and Black Currawong. Many small birds that could not be identified were also present, indicated by the large column for Ibbs, which could have included pardalotes, silvereyes and Tasmanian Thornbills on occasions when they could not be identified separately, as well as other species that were not positively identified at any site. Seven of the species were endemic, not including possible IIb species; only the Laughing Kookaburra was introduced to Tasmania (Table 2).

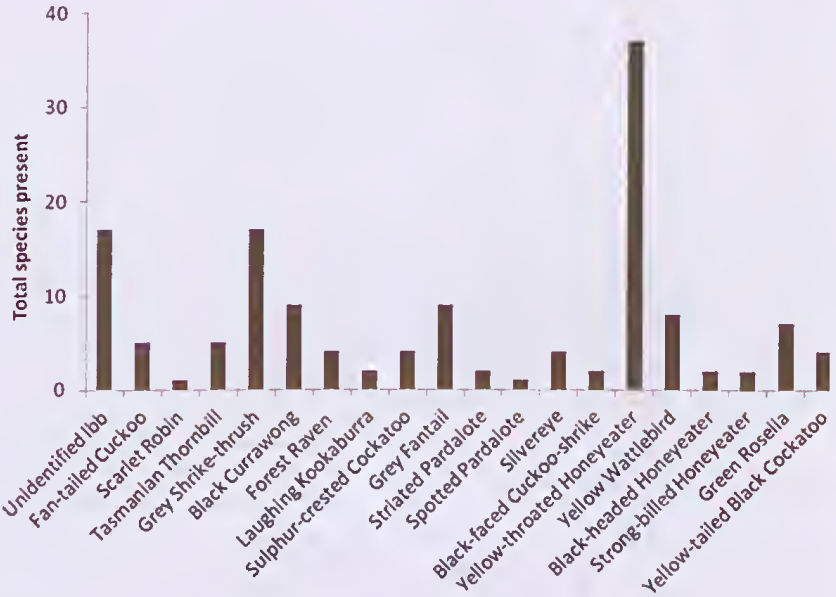

Figure 1. Frequency of bird species present during five summer months in six *E. nitens* plantations around Tasmania, December 2010 to April 2011

There were approximately three-fold differences among sites in both total species present and frequencies of occurrence per site and occasion (Table 2). These differences seemed to be most closely related to the site characteristics, density of the understorey or ground cover, and surrounding land use, rather than latitude or altitude (Table 3). The highest species richness (16 and 14 species) and frequency of recording occurred in two northern plantations, Castra and Moina that both had a medium or high density of understorey shrubs, and which were also adjacent to grazing land. As well as having higher numbers of most species, five species were observed only in these two plantations: Laughing Kookaburra, Forest Raven, Black-faced Cuckoo-shrike, Scarlet Robin and Striated Pardalote. The next highest species richness was at the southern site, Franklin, that had a medium understorey, followed by Repulse that had dense understorey comprising bracken rather than taller shrubs. Only six species were recorded in the two plantations with the sparsest understorey, one at low altitude in the north and one at high altitude in the south of the State; the southern site, Wentworth, was

Table 2. Frequency of occurrence of bird species in two plots at six *E. nitens* plantations in Tasmania over five months (maximum count 10 per site)

Bird species *	Sites						Total
	Crayfish	Castra	Moina	Franklin	Repulse	Wentworth	
Unidentified lbb	3	3	5	3	2	1	17
Fan-tailed Cuckoo	0	0	1	0	0	0	1
Scarlet Robin	1	2	1	1	0	0	5
Tasmanian Thornbill (E)	1	2	2	0	0	0	5
Grey Shrike-thrush	2	6	5	2	1	1	17
Black Currawong (E)	0	1	0	2	2	4	9
Forest Raven	0	2	2	0	0	0	4
Laughing Kookaburra (I)	0	1	1	0	0	0	2
Sulphur-crested Cockatoo	0	1	0	2	1	0	4
Grey Fantail	3	4	0	2	0	0	9
Striated Pardalote	0	1	1	0	0	0	2
Spotted Pardalote	0	0	0	0	1	0	1
Silvereye	0	2	1	1	0	0	4
Black-faced Cuckoo-shrike	0	1	1	0	0	0	2
Yellow-throated Honeyeater (E)	8	8	9	8	2	2	37
Yellow Wattlebird (E)	0	3	3	1	0	1	8
Black-headed Honeyeater (E)	0	0	1	1	0	0	2
Strong-billed Honeyeater (E)	0	1	1	0	0	0	2
Green Rosella (E)	0	2	0	1	3	1	7
Yellow-tailed Black-Cockatoo	0	1	2	0	1	0	4
Count of species[§]	5	16	14	10	7	5	19
Frequency of species occurrence	18	41	36	24	13	10	142

(E) endemic species; (I) introduced species

* Nomenclature according to Simpson & Day (2010)

[§] Excluding unidentified lbbs

Table 3. Frequency of occurrence of bird species in two plots at six *E. nitens* plantations in Tasmania with different site characteristics

	Site feature (number of sites)						
	Latitude		Altitude		Understorey		
Species *	Nth (3)	Sth (3)	High (3)	Low (3)	Sparse (2)	Medium (2)	Dense (2)
Unidentified Ibb	11	6	8	9	4	8	5
Fan-tailed Cuckoo	1	0	1	0	0	1	0
Scarlet Robin	4	1	1	4	1	2	2
Tasmanian Thornbill (E)	5	0	2	3	1	2	2
Grey Shrike-thrush	13	4	7	10	3	7	7
Black Currawong (E)	1	8	6	3	4	2	3
Forest Raven	4	0	2	2	0	2	2
Laughing Kookaburra (I)	2	0	1	1	0	1	1
Sulphur-crested Cockatoo	1	3	1	3	0	2	2
Grey Fantail	7	2	0	9	3	2	4
Striated Pardalote	2	0	1	1	0	1	1
Spotted Pardalote	0	1	1	0	0	0	1
Silvereye	3	1	1	3	0	2	2
Black-faced Cuckoo-shrike	2	0	1	1	0	1	1
Yellow-thr. Honeyeater (E)	25	12	13	24	10	17	10
Yellow Wattlebird (E)	6	2	4	4	1	4	3
Black-headed Honeyeater (E)	1	1	1	1	0	2	0
Strong-billed Honeyeater (E)	2	0	1	1	0	1	1
Green Rosella (E)	2	5	4	3	1	1	5
Yellow-tailed Black-Cockatoo	3	1	3	1	0	2	2
Count of species§	18	12	18	17	8	18	17
Frequency of species occurrence	95	47	59	83	28	60	54

(E) endemic species; (I) introduced species

* Nomenclature according to Simpson & Day (2010)

§ Excluding unidentified Ibbs

one year younger than the other plantations.

Total species of birds present (site average 9–14 species) and overall frequency of speeies recorded (40–53) werc remarkably eonstant eaeh month, apart from low numbers in December (Table 4). This is despite some individual speeies, sueh as euekoos, demonstrating seasonal variability in oeeurrence. Only two bird species were reeorded solely in the early summer – Fan-tailed Cuckoo and Black-faeed Cuckoo-shrike. These are both summer migrants that are likely to bc more visible or audiblc in early summcr.

All but one species (Sulphur-crested Coekatoo) are classified as ineluding insects in their diet aeeording to Hobbs et al. (2003) (Table 4). Most of the birds were foraging aetively in the canopy rather than in the understorcy or on thc ground. One Yellow-throated Honeyeater was observed on a stump removing the wings off a butterfly before eating its body.

Leaf beetle populations

The mean populations of adult leaf beetles varied 6-fold among the six sites and even more widely within sites between individual trapping periods and aeross the season (Table 5, Figure 2), as estimated by the stieky traps. The traps showed that the highest average populations of all ehrysomelid species werc at Moina and Crayfish in the north followed by Wentworth in thc south. *Paropsisterna bimaculata* was the dominant species present at Crayfish in the north and all thrce southern sites, while at Moina the population eomprised mainly *P. selmani* followed by *P. agricola* (Table 5). The highest populations occurred at most sites early in the summer (November to mid December), with a smaller, second population peak during late December to mid January at most sites, then decreasing (Figure 2). Only at Moina did the late peak continue until mid-February, eomprised mainly of *P. selmani* adults. After Repulse and Moina werc sprayed with inseetieide in late Dcccmber and late February, respectively, populations remained at virtually zero for the rest of season (Figure 2).

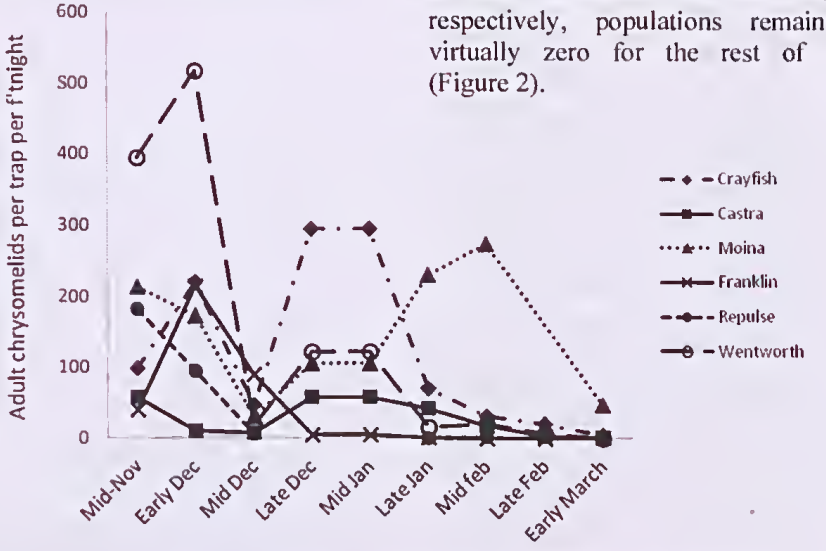

Figure 2. Seasonal variation in adult ehrysomelid leaf beetle populations (all species), over five months assessed by eontinuous trapping on stieky traps in six plantations (eolleetions were made monthly in Deeember and Mareh so the data were averaged per fortnight)

Table 4. Frequeney of oecurrenee of bird species present monthly in two plots at six *E. nitens* plantations in Tasmania (maximum 12 per month), elassified by functional group

Group†	Bird speeies	Scientifie name	Dec	Jan	Feb	Mar	Apr	Total
	Unidentified lbb	several speeies	1	5	3	6	2	17
1	Fan-tailed Cuckoo	*Caeomantis flabelliformis*	1	4	0	0	0	5
1	Scarlet Robin	*Petroica boodang*	0	0	0	0	1	1
1	Tasmanian Thornbill (E)	*Aeanthiza ewingii*	0	0	1	0	4	5
4	Grey Shrike-thrush	*Collurieinela harmoniea*	5	5	3	2	2	17
4	Blaek Currawong (E)	*Strepera fuliginosa*	4	3	0	0	2	9
4	Forest Raven	*Corvus tasmanieus*	0	0	2	1	1	4
4	Laughing Kookaburra (l)	*Daeelo novaeguineae*	0	1	0	1	0	2
5	Sulphur-erested Cockatoo	*Caeatua galerita*	2	0	1	1	0	4
6	Grey Fantail	*Rhipidura albiseapa*	0	2	3	2	2	9
6	Striated Pardalote	*Pardalotus striatus*	0	0	1	0	1	2
6	Spotted Pardalote	*Pardalotus punetatus*	0	0	0	1	0	1
6	Silvereye	*Zosterops lateralis*	0	0	1	1	2	4
6	Black-faeed Cuckoo-shrike	*Coraeina novaehollandiae*	1	1	0	0	0	2
7	Yellow-throated Honeycater (E)	*Lichenostomus flavieollis*	5	9	8	7	8	37
7	Yellow Wattlebird (E)	*Anthoehaera paradoxa*	1	2	3	1	1	8
7	Black-headed Honeyeater (E)	*Melithreptus affinis*	0	0	1	0	1	2
7	Strong-billed Honeycater (E)	*Melithreptus validirostris*	1	0	1	0	0	2
7	Green Rosella (E)	*Platyeereus ealedonieus*	1	0	1	3	2	7
7	Yellow-tailed Black-Cockatoo	*Calyptorhynehus funereus*	0	0	1	2	1	4
	Count of species§		9	8	13	11	13	19
	Frequency of species occurrenee		22	53	49	40	43	142

† Based on Hobbs et al. (2003). (Group = functional group: 1 = understorey/ground feeder (inseetivore); 4 = canopy/understorey/ground feeder (inseetivore/carnivore); 5 = eanopy/understorey/ground feeder (granivore/frugivore); 6 = canopy/understorey/ground feeder (insectivore); 7 = eanopy/understorey/ground feeder (neetarivore/frugivore/inseetivore). Only group 5 does not feed on inseets. § excluding llbs

Relationships between birds and leaf beetle populations

No correlation was evident among the six sites between frequency of bird species present and leaf beetle populations estimated using sticky traps, averaged over five months (Figure 3).

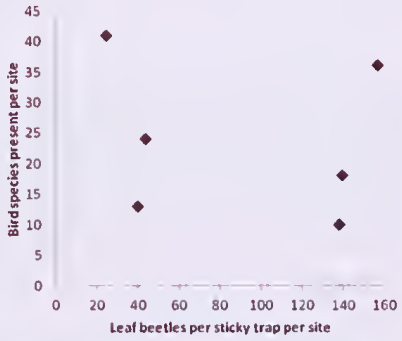

Figure 3. Relationship between leaf beetle populations monitored on sticky traps and frequency of bird species present in six sites, averaged per site throughout December 2010 to March 2011

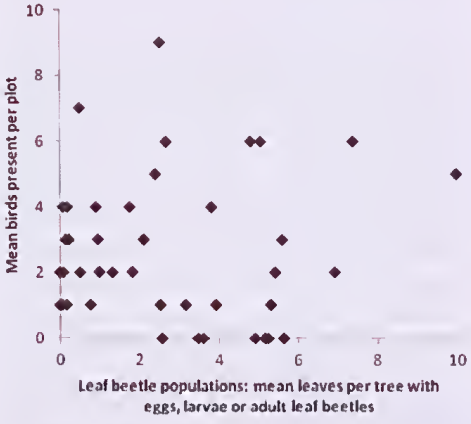

Figure 4. Relationship between leaf beetle populations monitored on *E. nitens* trees and frequency of bird species present monthly per plot for four months, averaged over all distances and transects per plot and month

Similarly, the scattergram of the frequency of bird species present with leaf beetles monitored monthly at two plots in each site showed no significant correlation (Figure 4). No statistical analyses were carried out since both graphs clearly indicated the lack of correlation between the bird and beetle populations.

DISCUSSION

A species richness of 19 species, not including some lbbs, recorded in 'introduced *E. nitens*' plantations in Tasmania compares favorably with a maximum of 24 and 23 species recorded in pre- and 10 years post-logged regenerated dry sclerophyll forest respectively in northeast Tasmania (MacDonald et al. 2005). The most commonly sighted species by MacDonald et al. (2005) were the lbbs Brown Thornbill and Tasmanian Scrub-wren that were not positively identified in the current study, but may have been present. The Superb Fairy-wren was the third most commonly sighted species by MacDonald et al. (2005) so it is curious that Superb Fairy-wren was not recorded in the current study; it is unlikely to have been missed since it is so distinctive in call, colouring and behaviour. Possibly there were not enough open areas in the plots. Yellow-throated Honeyeater was the most commonly recorded bird species in this study, whereas it was well down in the frequency list of MacDonald et al. (2005). Yellow-throated Honeyeaters might have been sighted more frequently because they appeared to be attracted to the bright yellow hard hat worn by the monitor and/or the yellow sticky traps erected on the transects; alternatively it may be related to the frequency of their calling throughout the day.

The species richness is also comparable with numbers observed in 'introduced *E. globulus*' plantations in Western

Australia. Hobbs et al. (2003) recorded 26 species within WA blue gum plantations, of which 92% included insects in their diet, compared with 33 species on the edge bordering native forest remnants. Matsuki (2005; unpubl. MS) conducted surveys at a similar time of day but weekly for a longer period than the current study in Tasmania, along the edge of blue gum plantations that bordered remnant forest, firebreaks or pasture. He recorded a total of 72 bird species 'in and around' the plantations, 56 species 'using' the plantation vicinity for feeding or resting but only 16 species actually within the plantations. Of those 16 species, only 48% ate insects compared with 95% of the Tasmanian plantation species that included insects in their diet. The number of individual birds present was not accurately quantified in the current study since some species foraged singly or in pairs while others, notably the parrots and black-headed honeyeaters, foraged in flocks; more often they were heard but not seen so would have been difficult to quantify.

Although the plantation species *E. nitens* is introduced to Tasmania, its similarity to the native blue gum, *E. globulus*, means that it is well accepted by native wildlife, so that all birds except Laughing Kookaburra were native to Tasmania, and over one third were endemic to Tasmania.

There were few sources of flower nectar within the plantation during the summer since the plantation *E. nitens* trees were too young to be flowering and most understorey shrubs had finished flowering by December: only blackberries, buzzies and *Senecio linarifolius* were seen flowered during December to January. Another source of sugar for nectivorous birds would have been 'manna', crystallized sugary sap that *E. nitens* produce prolifically when foliage is damaged by wind or insect browsing (as distinct to manna from lerps and scales produced by insects). There would have been many small insects available for birds to feed on the leaves, branches and trunks, such as psyllids, scale insects, moths and moth larvae; however, all stages of the eucalyptus leaf beetles would have comprised a significant proportion of the canopy insects (Loch 2005). Smaller birds (Silvereye, Olive Whistler and cuckoo species) have been observed taking chrysomelid larvae, and larger birds such as corvids (Forest Raven and currawong species), Laughing Kookaburra and Magpies have been recorded preying on adult leaf beetles in Tasmania (C. Spencer & K. Richards, pers. comm. 2009). This suggests that many bird species would have been preying on leaf beetles in the plantations.

Both frequencies of bird species recorded and leaf beetle populations varied considerably among sites, but there was no positive or negative correlation between the birds and beetles. However bird species varied very little from month to month over the summer and autumn, apart from low numbers in December, which may be partly accounted for by a learning curve for identifying calls. This is despite some species being highly seasonal, such as cuckoos. Their higher prominence in the early summer may have been counterbalanced by improved identification of the Ibbs later in the summer. By contrast, leaf beetle populations showed very large monthly variations over the five months of sampling. Therefore, it is not surprising that there was also no observed correlation between monthly frequencies of bird species recorded and estimates of chrysomelid leaf beetle populations monitored on the trees. The lack of any observable correlations between bird and beetle populations, either by site or by month, suggests that, although most birds

recorded in the plantations are partly insectivorous and some species have been shown to eat leaf beetles, birds probably prey only opportunistically on eucalypt leaf beetles but do not contribute to the management of potentially-damaging populations in plantations. More extensive, designed experiments, such as field exclusion trials, would be required to conclusively demonstrate the importance of the role of birds as predators of leaf beetles.

Species frequency was highest at sites with the most understorey and where grazing pasture bordered the plantations. Other studies have shown that bird populations in eucalypt plantations are significantly higher with increased proximity to forest remnants (Loyn et al. 2007), and with retention of native vegetation near plantations (Hobbs et al. 2003; Lindenmayer & Hobbs 2004). The present study suggests that other site factors could be important to bird populations, such as the amount of understorey within the plantation, and variation in the land used bordering plantations, such as grazing pasture.

In the interests of retaining or improving diversity within eucalypt plantations, plantation management that conserves some understorey and maintains a mosaic of land uses in the landscape where possible should help support higher bird populations, although this may not contribute to managing leaf beetle populations.

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CRASSULA NATANS VAR. *MINUS* (FLOATING STONECROP) IN TASMANIA: NATIVE OR EXOTIC?

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INTRODUCTION

In recent years I have become interested in weeds in Tasmania. As part of undertaking surveys for various development proposals, reserve management plans and other activities on different land tenures in all parts of the State, I am constantly surprised by the presence of weeds in even the remotest corners of Tasmania. Is it possible to find a place that is entirely free of exotic plant species in the State? While weeds can be found in remote locations, there are some large parts of Tasmania that remain effectively weed free. Conversely, many of our city and suburban streets are now home to native species, happy to take advantage of temporary niches on walls and footpath cracks (some species are even more common in "our" environment than their "own" – think of *Cotula australis*, more often seen in a crack in bitumen than in a grassy woodland). But for some species the question arises: how do we know if the species is native or exotic? Have they been deliberately introduced, escaped from a domestic garden or cultivated crop, entered accidentally in stock feed, or arrived in some other way? One way is to look through the collecting record – if the species was recorded in the earliest of colonial times, it is perhaps fair to assume it was already here when Europeans arrived. But if it took decades, or more than a century even, to first detect a species, it may be easier to assume that it is a late arrival but it does not necessarily follow that the species is exotic. Many of our obviously native species took until the 1980s or even later to be first collected – how we overlooked some species that are actually quite distinct (i.e. it was not a taxonomic quirk that meant we missed it) and often locally common. Take for example a species like *Mirbelia oxylobioides*, a locally common species in the Heathy Hills reserve near Clifton Vale in the southern Midlands that was not recorded in Tasmania until 1998 – nearly 140 years after it was described (and known from mainland Australia).

CRASSULA NATANS VAR. *MINUS*

What is it?

In this paper I use *Crassula natans* var. *minus* (floating stonecrop), a member of the Crassulaceae family (mainly species of succulents such as *Crassula*, *Aeonium* and *Sedum*), as an example species to demonstrate some of the issues in trying to determine whether a species is indigenous or native.

I first came across *Crassula natans* var. *minus* when I visited King Island in 2007. There it occurred as a semi-aquatic annual herb of inundated wet heathland. It was half-floating in the shallow water and sprawling over the bare muddy edge of the wetland (Plate 1). This was the first time the species had been detected on King Island, and I wondered whether it was more widespread in the State.

I chose this species to explore the notion of indigenous versus alien species, because when I first encountered it in Tasmania I assumed, by virtue of the location and habitat, that it must have been indigenous, only to find out that it is considered introduced/naturalised in Australia. As I began to encounter the species more frequently, I began to question its status.

Description

Crassula natans var. *minus* is an annual herb with filiform stems. It is often much-branched, especially when growing exposed on muddy ground with stems to about 10 cm long, but less branched and with stems up to 35 cm long when floating. The leaves are linear to linear-elliptic, 1–8 mm long and 0.2–2.2 mm wide, usually slightly fleshy and green to reddish-brown giving the plants an overall reddish appearance (Plate 1). The species has tiny white flowers that are usually solitary and occur in the axils of the leaves (Plate 2).

Plate 1. The distinctive red stems of *Crassula natans* var. *minus* sprawling over bare muddy ground (Nook Swamps, King Island)

Crassula natans var. *minus* could be confused with other annual (and indigenous) species of *Crassula* such as *C. decumbens*, *C. helmsii* and *C. peduncularis*, although there are good keys available to differentiate between them (e.g. Toelken 1981; Toelken et al. 1996; Utas 2011).

Distribution in Tasmania

The *Census of the Vascular Flora of Tasmania* at the time (Buchanan 2007) listed the species as naturalised, but even then I wondered on what basis this decision had been arrived at. The latest *Census* (Baker & de Salas 2012) continues to list the species as naturalised. The *Flora of Victoria* (Toelken et al. 1996) listed it as exotic to Victoria, simply noting that it is originally from South Africa. Online State government floras all list the species as naturalised to Australia.

Plate 2. Flowering branches of *Crassula natans* var. *minus* growing amongst *Isolepis hystrix* (the green tufts), an herbaceous annual sedge that is also known from a limited number of Tasmanian collections and is considered as naturalised rather than indigenous

Since my first encounter on King Island I have collected it from Lulworth, Petal Point and Curries River Reservoir (all in the State's northeast) and from Dartys Corner on the northwest coast (see Table 1 for details). While many of these sites are disturbed and support a range of annual exotic plant species, several support native species that have conservation significance (e.g. threatened annual herbs such as *Stylidium despectum* and *Phyllangium divergens*). A search of the *Atlas of Living Australia* yielded a few additional collections from Tasmania, and Toelken (1981) cites a record from Badger Island. Thus, bringing the number of documented populations to nine (Table 1, Figure 1).

Table 1. Populations of *Crassula natans* var. *minus* in Tasmania

Location	Collection details [1]	Comments (including tenure) [2]
Badger Island	date not stated Whinray AD no. not stated	No collection notes available Cited in Toelken (1981) but not included in *Atlas of Living Australia* records Private property
Flinders Island, Furneaux Group, Long Point	17/08/1975 J.S. Whinray AD 98110152 CANB 533240 MEL 0575967A	No collection notes available Tenure unknown
Bluemans Creek	18/11/2003 A. North	Grassy flat with scattered *Eucalyptus viminalis*, poorly-drained, with localised pools (A. North, pers. comm.) No collections (DPIPWE *Natural Values Atlas* data) Private property
Big Waterhouse Lake Road, 1 km from lagoon	14/11/2007 M. Visoiu HO 546255	Dried-out depressions in old gravel pit; more or less herbaceous wetland; also aquatic in some areas of wetland Waterhouse Conservation Area
Nook Swamps, King Island	18/11/2007 M. Wapstra HO 547643	Muddy fringes of inland freshwater ephemeral wetland amongst wet heathland Lavinia State Reserve
Dartys Corner, S of Temma	31/08/2008 M. Wapstra HO 551057 MEL 2355513A	Ephemerally muddy frequently used 4WD track between Temma and Sandy Cape amongst windswept coastal heathland Arthur-Pieman Conservation Area
Lulworth, old tip site	13/10/2008 M. Wapstra HO 551824	Ephemeral pond edge (old tip scrape) Crown Land
Curries River Reservoir (near George Town)	13/10/2008 M. Wapstra HO 551823	Retreating muddy shore of large water impoundment State Forest
Elbow Bay, Inner Sister Island	05/12/2010 M. Visoiu	small (10 x 10 m) granite wetland/waterhole – only freshwater on island (likely stopover spot for birds) No collections (DPIPWE *Natural Values Atlas* data) Sister Islands Conservation Area
Granite Lagoon, King Island	14/12/2011 M. Visoiu	in the flat damp granite gravels around the margins there, was well established and extensive No collections (M. Visoiu, pers. comm.) Crown Land (proposed reserve)

[1] AD, HO, MEL, CANB = formal herbarium collections; [2] comments taken from herbarium sheets, personal observations by the author or as otherwise indicated

Figure 1. Distribution of *Crassula natans* var. *minus* in Tasmania (compiled from various sources including the *Atlas of Living Australia* and the *Natural Values Atlas*, both accessed 4.11.2012, and records from the Tasmanian Herbarium)

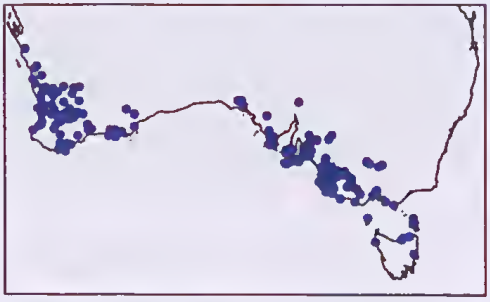

Figure 2. Contemporary Australian distribution of *Crassula natans* var. *minus* (*Atlas of Living Australia*; accessed 4.11.2012)

Distribution in Australia

Toelken (1981) was firm in the view that *Crassula natans* was not indigenous to Australia, stating that "although the typical variety [var. *natans*] is more widespread in South Africa and is usually common it has not been introduced into Australia". The first Australian specimen of the species was collected in 1883 from the vicinity of Perth, with several additional collections from the same area between 1898 and 1902 (Toelken 1981). While Toelken (1981) noted that "there were no further records from Australia until the late 1950s), the species had a sporadic collection history in that period with about 10 collections (*Atlas of Living Australia* website at www.ala.org.au, accessed 4.11.2012). In the early 1980s the species appeared to be widely distributed in southwest Western Australia, eastern South Australia, western Victoria and Badger Island in the Furneaux Group (Toelken 1981). The species is now known to have a much wider distribution, or has at least been recorded more often, occurring in a greater part of Western Australia, South Australia, Victoria and Tasmania (Figure 2). Given that the species was collected as early as 1883 and has such a sporadic collection history (suggesting it is overlooked and/or scarce), what is the evidence that the species was introduced into Australia? What was the mechanism for this introduction as early as 1883? It is interesting to note that there are other herbaceous species that display a similar distribution and pattern of spread to that shown by *Crassula natans* var. *minus*. *Disa bracteata* (known in Australia as the 'South African weed orchid'), native to South Africa, first appeared in Western Australia about 60 years ago (1950), and has slowly spread east across southern Australia, finally appearing in Tasmania in the 2000s.

Status

Crassula natans usually grows "...on marshy soil around standing water but occasionally plants are inundated..." (Toelken 1981): this habitat description is consistent with the observed habitat in Tasmania. Could aquatic and wading birds be the mechanism for the dispersal of the species between continents? Recently, the

species was reported from New Zealand (de Lange et al. 2011), from where it had hitherto not been recorded, collected from the botanically significant Lake Waiporohita on the North Island. Lake Waiporohita is an important habitat for a range of aquatic birds, including several that are mostly Australian and regarded as uncommon and/or vagrant species in New Zealand (de Lange et al. 2011). de Lange (1997) had previously treated species such as *Gratiola pedunculata*, a largely Australian species but also present at Lake Waiporohita, as indigenous, suggesting trans-Tasman avian dispersal of sticky seeds. At virtually all of the sites I have observed *Crassula natans* in Tasmania I have also observed wading and/or "dabbling" birds such as ducks, swan, lapwings and gulls. I believe it is a realistic scenario that such birds could carry dislodged stems (and associated adventitious roots) and/or seeds on feet and amongst feathers between wetlands and similar habitats, and that long-distance transport between mainland Australia and Tasmania (perhaps via Bass Strait islands) is feasible. I do not know of particular species of birds that migrate between South Africa and Western Australia that may have facilitated the first trans-Indian dispersal of *Crassula natans* to Australia.

So is *Crassula natans* exotic or indigenous to Tasmania? In relation to its status in New Zealand, de Lange et al. (2011) concluded that, because the species is not indigenous to Australia from whence the New Zealand population is postulated to have originated rather than the apparently native South Africa, it should also be regarded as naturalised in New Zealand. Using a similar argument, the Tasmanian populations could also be considered to be naturalised, but only if it is assumed that these originated from mainland Australian populations and that these in turn were deliberately or accidentally introduced from South Africa. There is no definitive evidence to support the case for an indigenous or a naturalised status for the species in Tasmania.

Bean (2007) explored means of determining the status of species in Australia, and provided a set of criteria against which to assess species, which included considerations of ecological, phytogeographical and historical factors (the "EPH system"). Using the EPH system, *Crassula natans* var. *minus* would be classified as "alien" based simply on the "historical evidence indicated that the species was not present in the region [Australia] before European settlement (e.g. first herbarium records are well after this time)".

If *Crassula natans* var. *minus* is a weed, should we treat it as such and try to eradicate or control it? Does it pose any threats to natural wetland habitats? Probably not – I have only ever seen very small patches of the species, it does not appear to be prone to rapid spread and it seems to be a poor competitor with other semi-aquatic herbs (both native and exotic). Interestingly, de Lange et al. (2011) suggested that "as a precautionary measure further study into the impact [of the species] in New Zealand is urgently needed", although it was "too early to say what effect [it] may have [on wetland turf communities]". These authors thought that its rapid growth and prolific seed production would facilitate it smothering smaller turf plants.

If *Crassula natans* var. *minus* is indigenous, should we treat it as a conservation-dependent species? Many other annually flowering wetland herbs are listed as threatened on the Tasmanian *Threatened Species Protection Act 1995*, usually on the basis of few and disjunct collections, limited population information and inferred threats to wetland habitats.

I suggest that until a definitive answer is available on the origin of *Crassula natans* var. *minus* in Tasmania, we should treat the species cautiously (e.g. monitor populations and continue to document its distribution) but certainly not as a threatened indigenous species on two grounds. First, making land management decisions on the uncertain indigenous status of a species is likely to be a legal quagmire. Second, despite the limited collections in Tasmania, its current distribution is widespread, it has probably been overlooked and may be substantially more common, it often occurs on semi-disturbed sites and does not appear to be directly threatened by current land uses at known sites, and it occurs in a number of reserves.

CONCLUDING REMARKS

Bean (2007) noted that the "origin status" of plants has traditionally mainly been of interest to plant geographers and taxonomists but that in recent years such information is of importance to other areas of study including species conservation and vegetation management, biological weed control, floristic evaluation and biogeogaphical analysis. I would add that working out whether a plant is indigenous or naturalised to a country, state or region is important to understanding dispersal mechanisms of species, and monitoring effects of such factors as climate change and other ecosystem-level changes (e.g. changes in migration patterns of birds).

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Atlas of Living Australia website at www.ala.org.au, accessed 4.11.2012, incorporating records provided by the Tasmanian Department of Primary Industries, Parks, Water and Environment (*Natural Values Atlas* as cited above), Tasmanian Seed Conservation Centre, and *Australia's Virtual Herbarium*, a resource of the Council of Heads of Australasian Herbaria and its member Herbaria listed at www.chah.gov.au.

OBSERVATION OF A YELLOW-BELLIED SEASNAKE (*PELAMIS PLATURUS*) ON MARIA ISLAND

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THE OBSERVATION

On 31 December 2011, we came across an adult yellow-bellied seasnake (*Pelamis platurus*) at Bloodstone Beach on Maria Island's west coast (42°38′56″S, 148°2′17″E). We are guides with *The Maria Island Walk* and were with a group of guests, enjoying the warmest day on Maria Island that month. Having seen no other snakes on our journey, we were perplexed and quite excited by our finding. The snake (Plates 1–3) was lying in the tidal zone and was dead when we found it, although it appeared recently deceased (its eyes had not been pecked out by birds, and it didn't smell). The pacific gulls were showing some interest in it and were probably responsible for the fresh blood on its tail and near its head, but otherwise the seasnake had no obvious injuries.

Plate 1. Whole specimen of the yellow-bellied seasnake, as washed up at Bloodstone Beach

OTHER RECORDS FROM TASMANIAN WATERS

[This information is partially courtesy of the *Atlas of Living Australia*, downloaded on 12/11/2012].

The yellow-bellied seasnake is one of the most widely distributed seasnakes in the world, and is capable of living and giving birth entirely in the open sea (it is totally pelagic). It is found in all coastal waters between the 18–20°C isotherms around the rim of the Pacific Ocean except Alaska south to southern California, and in the coastal waters of the Indian Ocean from the Persian Gulf eastwards.

Currents occasionally carry the snakes into temperate waters, but these are almost certainly far from their breeding and

feeding waters. In New South Wales, the species occurs occasionally as both living and dead strandings all along the east coast. These strandings have often coincided with either strong onshore winds or storms. The majority of sightings have been of specimens in poor condition, most likely carried down passively by currents from warmer waters (Australian Museum 2011).

Plate 2. Whole specimen showing the distinctive yellow belly that gives the species its vernacular name and the paddle-like tail that facilitates its wholly pelagic existence

There are only 14 records (some may be database duplicates and there is also low precision associated with many records) of the yellow-bellied seasnake from Tasmanian waters (Figure 1). The first recorded specimen was found stranded but alive at Shelly Point, north of Seamander in 1919 (Lord 1919). Additional recorded sightings occurred in 1921, captured live at St Helens by T. Haley (Scott 1931), 1967, 1976, 1979 and 1988 in various parts of northern Tasmania including Devonport, Flinders Island, Great Musselroe Bay, Eddystone Point and the St Helens area. The recent sighting on Maria Island is the most southerly record in Tasmanian, and indeed Australian, waters.

Figure 1. Distribution of records of the yellow-bellied seasnake from Tasmanian waters: circles = records from the *Atlas of Living Australia*; solid square = Maria Island sighting; open square = Lord (1919)

IMPLICATIONS?

Reports of tropical-subtropical marine fish species reaching Tasmanian waters more frequently in recent years are now widely accepted, and are being used as possible evidence of warming waters, perhaps as a result of global climate change. Records of the yellow-bellied seasnake in our waters may also be indicative of warming seas (the waters around Maria Island on the day of the most recent discovery were noticeably warmer than expected, so much so that we swam at all five beaches we walked along). Storm activity (strong winds) and currents may also play an important role in bringing the species into Tasmanian waters.

ACKNOWLEDGEMENTS

Thanks to Mark Wapstra (database checks and editing) and the team at *The Maria Island Walk*.

Plate 3. Close-up of the head and tail of the specimen, showing the distinctive paddle-like tail (note the ring for scale)

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BOOK REVIEWS

Curious Minds: The Discoveries of Australian Naturalists *by Peter Macinnis, NLA Publishing. (2012), softback, 213 pages (ISBN 978-0-642-27754-1)*

REVIEWED BY: **Mark Wapstra**, 28 Suncrest Avenue, Lenah Valley, Tasmania 7008

I enjoy writing reviews of books I enjoyed reading. It is much easier than having to be a pedant and nit-pick about small errors in fact or syntax. Also, writing a book review about the role naturalists have played in scientific endeavour and discovery in Australia for a bunch of field naturalists is easy. So, in summary, I thoroughly recommend *Curious Minds* to all members of the Tasmanian Field Naturalists Club (it will be in the library).

Perhaps you were thinking I would leave it there as the shortest book review ever! But I will give you a few insights that hopefully make you want to pick up this book and confirm in your mind how useful and clever field naturalists can be!

Curious Minds is a superbly researched and thoroughly thought out book. It tells the story of the early naturalists in Australia, people who were critical to advancing scientific knowledge and promoting infant ideas of conservation. The author has cherry-picked from what is a potentially huge cherry tree of names and events in Australian natural history. But the bowl of cherries produced in the form of chapters on about 40 key figures in our natural history discovery, illustration, collection and preservation will take you some time to consume.

To give you a taste, try these chapter headings! Boomerang Screws and Big Wombats; Bagging the Bunyip; A Taste of the Devil, the Kangaroo and Parkinson's Fig; The Fussy Pyrate and the Hippo; and Curiosity Killed the Botanist. Nope, I'm not going to tell you who or what those chapters are about!

Curious Minds is lavishly illustrated with portraits, landscapes, drawings of plants and animals, cultural subjects and all manner of relevant illustration. The author clearly spent some time selecting suitable illustrations and the book is better for it. Even if one were to flip through and find a fascinating picture and read some text that goes with it, you would learn a great deal about Australian natural history.

The book importantly includes the role of women in the pioneering days of Australian natural history: botanical illustrators given little credit at the time, or criticised for wearing pants and searching out forest fauna and flora. Our own Louisa Anne Meredith gets a chapter dedicated to her, with most of it dedicated to her pre-Van Diemen's Land days.

Curious Minds is more than a book about Australian naturalists – it tells a story of the early history of the colony – economies, cultural identity, disputes, war, ambition, glory, loss, death, and of course, bunyips, butterflies and birds.

THE COLOURS OF GOOSE ISLAND

Els Wakefield

[Regular readers will know that Els Wakefield has been assisting with the research of Dr Bruce Rabertson on the breeding behaviour of Pacific Gulls on Goose Island in Bass Strait for several years – see her articles in the 2010 and the current issue of The Tasmanian Naturalist *– this piece, however, is not about the birds as such, but shows the delights of being a naturalist in Tasmania, that the observations we make can contribute to both scientific knowledge and life's rich tapestry].*

The first birds we saw when we arrived at the island were the Pacific Gulls. They are the reason for us being on Goose Island as this is their largest breeding colony in the world. I particularly noticed their bills – all evenly yellow with orange at the tips. On mainland Tasmania this is so different. There, breeding males have a definite black line along the cutting edge of the bill and the females have a dot at the upper tip and a blotch on the lower tip. These birds are in breeding plumage with bright white feathers. No birds have the occasional peachy glow about the chest that their Tasmanian mainland relatives show at this time of year. They posture, chase, court and preen but mostly stand or sit, relaxed but alert. Their simple black, white, yellow and orange colours blend perfectly with the island.

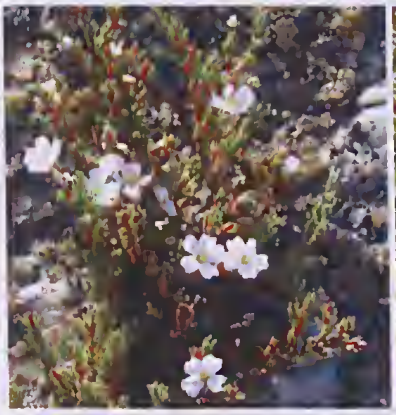
We land on the sheltered beach. The azure-blue water in the bay with the white sand below beckons me for a daily swim. Beside it the granite boulders and slabs – grey shades above the tide, brown below the tide line with gradations of lichens from orange to dark yellow, patches of black between the two and all topped with a soft green spongy layer that is lovely to tread on and would make a comfortable insulating layer for a snooze!

We see the occasional passer-by such as the bird that greeted us near the research hut when we arrived, a male Satin Flycatcher, its deep blue head and back iridescent like a tropical Bird of Paradise. It stayed for two days, perhaps to welcome us to this island paradise! Then it continued on its path to breed somewhere else.

Higher on the island the *Senecio* flowers are yellow with a dark yellow centre and other larger white-petalled daisies have yellow centres matching the senecios. There are purple-pink pig-face on dark green leaves with occasional red tips. The soft green grasses sprout amongst them all between the boulders and sometimes patches of shiny-leafed buzzies with fluffy, deep red balls, magnificent with dew on them when lit from behind! Clusters of pelargonium seek shelter among the rock shelves, their soft pink petals lined with darker pink delicate veins.

Along the saltier western shore are the broad fields of *Disphyma*, their orange-green and red leaves already a mass of colour before the pink flowers unfurl. In the full sun they open to form a blinding mass of pink but early in the dewy mornings as we pass, their petals still erect, they show the promise of the spectacle to come!

There are two patches of *Frankenia pauciflora* just above the water line on this western side of the island. Five white petals with indented tips, as big as a fingernail, dark red stems and dark green leaves. This is such a rare and exquisite plant, hugging the ground, gradually creeping over the *Disphyma* and between the rocks, even smothering the driftwood.



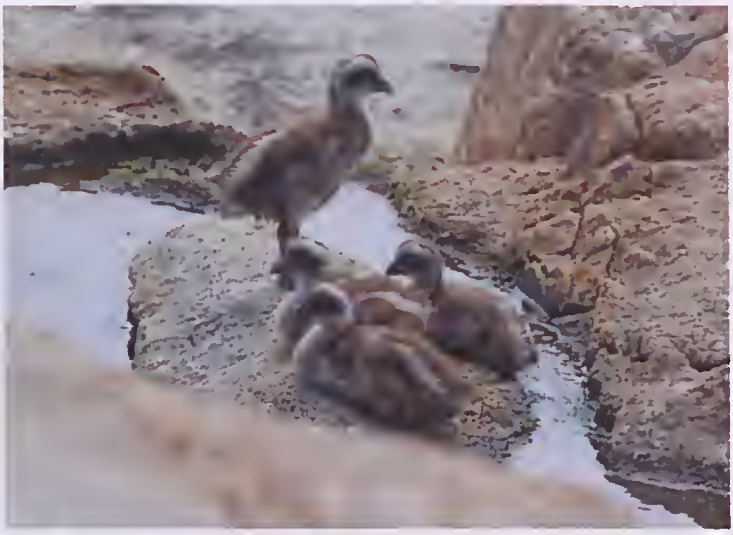
A surprise is the waft of perfume as we approach the ruins of the lighthouse keepers' cottages amongst which the recently appeared everlasting daisy bushes grow. Their tall flower clusters range from cream and bright yellow to deep orange and have a sweet, heavy scent unlike any other and quite unexpected for such a papery flower.

Nearby the coastal *Alyxia buxifolia* still has not flowered. Its dark green, waxy leaves shine full of promise but I suspect it needs a few more years as it is less than 50 cm tall. When it does, it will show tiny white, rotated, fragrant spirals.

There were small flocks of Blue-winged Parrots that used the island as a stepping stone, landing briefly on top of the boxthorns for a spell from the strong winds helping them south to the Tasmanian mainland. At first their orange bellies tricked me until I realised that male Blue-wings have these as well as Orange-bellied Parrots.

Some birds are mostly invisible such as the Brown Quail constantly calling to each other in enquiring tones. When they come out to sun themselves, their mottled patterns of brown and grey blend perfectly with the brown seed-heads of the *Bulbine* lilies and the granite boulders among the *Poa* tussocks. The "tek tek" of the Lewin's Rail warns us of its presence somewhere below the boxthorn but never shows itself. The grey-brown Little Grassbird, so cryptic with its white eyebrow and long tail, calls constantly and if I am very careful, I can glimpse it catching some sun early in the morning or late in the afternoon or as it makes a dash from one bush to another. It has been called the "telephone bird" because of its repeated triple notes, a reminder of our wonderful isolation!

Cape Barren Geese, always on the alert, walk cautiously amongst the tussocks and an adult often leads a crèche of goslings away as we approach. Their softly dappled greys blend perfectly with the storm-worn granite boulders along the coast where they shelter. A well-camouflaged group of motionless cream and brown fluffy stripies, too small to run, freeze beside the pool where the adults have left them to hide.



As dusk falls, the sky turns increasingly dark shades of pinkish-orange, the moon rises and the first stars appear. Then the first Short-tailed Shearwaters return. First a few, then the black dots in the distance become larger and the sky is filled with silent black birds, their wings shaped like a boomerang, soaring towards the land. They drop silently around us and walk to their burrows. Once inside, the noise of manic laughter begins! Standing on the granite slabs above the bay, we watch the silvery-grey water surface break as groups of Little Penguins carefully swim ashore. They arrive at a corner of the beach or climb up between the rocks, checking first for enemies, hanging back to allow the braver ones to test the situation first. Once in their burrows the combined chorus of mutton-birds and penguins begins. Lying in my tent, within centimetres of their nests, the sound is deafening! It is like a great choir of voices across the island, occasionally rising to a crescendo. As it slowly dies, it seems as if the whole island is purring and we all drift off to sleep. Before sunrise, the farewell calls of the mutton-birds briefly stir me from sleep as they depart for the day. There is a short silence before the dawn chorus begins.

Small gangs of inky black Sooty Oystercatchers circle each other on the rocks in agitated groups of three to six, their backs arched, red bills held vertically as if challenging each other, their red legs pacing stiffly.

Caspian Terns call in alarm as we approach their nesting area, flying over us and warning us not to come too close as the sun shines from behind them, back-lighting their white feathers and accentuating their menacingly large red bills.

Fairy Terns screech so loudly for such a small and delicate bird. One bird even calls shrilly to us with a fish held firmly in its bill, flying straight at us so that we suspect a nest site not far from where the Caspian Terns are sitting. They have been known to nest near them before, perhaps using them for extra protection.

One day, after the usual daily transect to check the nests and eggs of the Pacific Gulls, we continued on south of the lighthouse. This is a relatively flat area with clusters of tall, elongated boulders. One outcrop looks like enormous fingers curling up from the earth and if you find the right spot, they seem to hold up the lighthouse on an invisible palm!

Towards the southern tip of the island, a large group of Black-faced Cormorants are disturbed from their south-sloping slab, swimming onto the water, their glassy green eyes watching us warily from a safe distance. Ten Ruddy Turnstones eye us carefully from their ledge before making a short, rattling flight around the corner to another rock as the tide comes in. Their bright orange legs and black, white and orange tortoise-shell backs blend surprisingly well among the shadows.

Back at the main colony, the *Disphyma* opens in the sun as the day progresses and is almost blinding, catching the bright light reflected off the sea. I have little time to photograph it as the temperature is rising and we need to check the last nests and leave. There is a female Pacific Gull sitting tight on her nest with two eggs, keeping them cool. The male stays close by to make sure she is guarded. A garland of purple-pink *Carpobrotus* flowers, the fleshy leaves forming a soft bed for the eggs, surrounds the nest. This is the alpha pair, the first to hatch their eggs in the best spot on the island. They have the best nest in the best spot on the best island in the world with a perfect kaleidoscope of colours!

All images in this article are © Els Wakefield and were taken on Goose Island

ADVICE TO CONTRIBUTORS

The Tasmanian Naturalist publishes articles on all aspects of natural history and the conservation, management and sustainable use of natural resources, with a focus on Tasmania and Tasmanian naturalists. These can be either in a formal or informal style. Articles need not be written in a traditional scientific format unless appropriate for the content. A wide range of types of articles is accepted. For instance, the journal will publish articles that:

- summarise or review relevant scientific studies, in language that can be appreciated by field naturalists;
- stimulate interest in, or facilitate in identifying, studying or recording particular taxa or habitats;
- record interesting observations of behaviour, phenology, natural variation or biogeography;
- stimulate thinking and discussion on points of interest or contention to naturalists;
- put the study of natural history today into context through comparisons with past writings, archives, etc.;
- review recent publications that are relevant to the study of Tasmanian natural history.

Book reviews, web site reviews, poetry and prose and other informal natural-history related content are also accepted. If you are thinking of submitting such material, please check with the Editor first (to avoid duplication of items such as book reviews and for appropriateness of content).

Submission of manuscripts

Manuscripts should be sent to the editor, either emailed to nat.editor@tasfieldnats.org.au or mailed to the Club's address. Feel free to contact the Editor (see the Club's website for current contact details) prior to submission to discuss the format, style and content, or any particular submission issues (such as provision of large illustrations). Formal articles should follow the style of similar articles in recent issues. Informal articles need not fit any particular format (abstract needed only for formal articles). Please refer to the *Guidelines for Authors*, available on the Club's website.

Submissions should be provided in standard word processing format (i.e. .doc file). Please ensure all pages are numbered. Graphs, illustrations or maps should also be provided electronically by preference, generally in TIFF or JPEG format. Figures, especially photographs, should be supplied in high resolution (ideally 300 dpi) to ensure high quality reproduction. The Editor can assist with scanning of illustrations if originals are provided.

The Tasmanian Naturalist is printed in October and distributed to the Club membership and libraries during November/December. Articles, especially those that may require formal review by an external referee, need to be submitted by the end of July to ensure inclusion in the current year's edition. Please contact the Editor to discuss possible articles and the need for review, which may affect how much time is available.

Tasmanian Field Naturalists Club

G.P.O. Box 68, Hobart, Tasmania 7001

Founded 1904

Objectives

The Tasmanian Field Naturalists Club aims to encourage the study of all aspects of natural history and to advocate the conservation of our natural heritage. The club is comprised of both amateurs and professionals who share a common interest in the natural world.

Activities

Members meet on the first Thursday of each month in the Life Sciences Lecture Theatre 1 at the University of Tasmania at Sandy Bay. These meetings include a guest speaker who provides an illustrated talk. An excursion is usually held on the following weekend to a suitable site to allow field observations of the subject of that week's talk. The Club's committee coordinates input from members of the Club into natural area management plans and other issues of interest to members.

The Tasmanian Naturalist

The Club publishes the journal *The Tasmanian Naturalist*. This annual journal provides a forum for the presentation of observations on natural history, and views on the management of natural values, in both formal and informal styles.

Membership

Membership of the Tasmanian Field Naturalists Club is open to any person interested in natural history. Members receive *The Tasmanian Naturalist* annually, plus a quarterly bulletin with information covering forthcoming activities, and the Club's library is available for use.

Prospective members should either write to the Secretary at the above address, phone our President Michael Driessen on (03) 62 29 6382, or visit our web site at: http://www.tasfieldnats.org.au/.

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